

Engaging with Second Life: Real Education in a Virtual World

Literature Review

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October, 2008



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Forward

This literature review is the first step in the project, “Engaging with Second Life: Real Education in a Virtual World”. This project began as a dream for two educators, Clare Atkins and Aaron Griffiths, when they first explored Second Life and saw its potential for teaching and learning.

The project, funded through the New Zealand Tertiary Education Commission’s Encouraging and Supporting Innovation Fund, began in July, 2008. The project aims to determine and understand the additional value of a multi-user virtual environment, such as Second Life, to adult learning experiences, e.g. increased engagement or collaborative problem solving. The project also aims to increase the capability in New Zealand for educators and learners to teach and learn within Second Life. The project is being led by four tertiary institutions: Nelson Marlborough Institute of Technology, Otago Polytechnic, The Open Polytechnic of New Zealand and Wellington Institute of Technology. IBM and Telecom also support the project with representation on the project steering group.

The project stages are:

- identify suitable learning outcomes in which to pilot use of this technology.
- design learning experiences to achieve the selected learning outcomes and discover or develop resources (‘builds’) within Second Life to support the designed learning experiences.
- train staff who will pilot the learning experiences with learners.
- evaluate the learning from the phases of the project.
- share learning and resources from the project on the Ako Aotearoa website.

The lead institutions have pulled together a team with the necessary knowledge and experience to achieve the project aims:

Project leader – Second Life – **Clare Atkins** (NMIT)

Project leader – Real life – **Terry Neal** (contractor)

Researcher and evaluator – **Ben Salt** (contractor)

Learning designer – **Leigh Blackall** (Otago Polytechnic)

Lead developer – Client side – **Aaron Griffiths** (contractor)

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Acknowledgements

The authors gratefully acknowledge the rest of the project team in giving valuable feedback on the review, especially John Waugh and Terry Neal. They also thank the formal reviewers Steve Warburton and Bill Anderson for their wise, honest, and helpful comments. Finally, they recognise informal review from the ‘friends of the project’ who attend the weekly inworld meetings.

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1. Executive Summary

This literature review has drawn on work that would not normally be considered academically rigorous. This followed from an early decision that the purpose of the review was to inform in a practical sense the activities of the SLENZ project. The review brings together research findings, anecdotal reports of practice, and the opinion of those experienced in the use of Second Life (SL) for education. The review did not intend to look exclusively at Second Life although almost all reports of educational activity in multi-user virtual environments (MUVes) are about Second Life.

The review drew together a number of strands: an overview of the characteristics of the current generation of MUVes, a snapshot of educational activities currently in Second Life, a discussion of the major learning theories that may be relevant to the project, consideration of the design of learning activities and an exploration of what techniques could be used to control the development of the building of the relevant online resources.

MUVE is currently used as the term to describe a persistent 3D graphical environment accessed over the Internet which allows a large number of concurrent users, represented by their 'avatars' to interact synchronously. Second Life is the most advanced of these MUVes, also called 'virtual worlds', and allows not only synchronous and asynchronous communication but also the dynamic changing of the virtual environment through the ability for all users to 'build' within it. The Second Life world is constantly changing as avatars interact with it and with each other and all changes are immediately seen by all currently logged in users.

Second Life has been identified by many educational institutions internationally as having significant potential for teaching and learning and there is a current plethora of projects looking at educational possibilities. The areas covered include astronomy, medicine, music, literature, biology, history, forensic science, ecology and tourism. The ability to create complex environments and objects, the relative sophistication of its graphics, its relatively low cost of entry, the richness of its immersive experiences and the ability to create learning opportunities through game-like activities have appeal to both staff and students.

While Second Life provides a varied educational environment it is unlikely to entirely replace other forms of delivery and it is best seen as an adjunct to both face-to-face teaching and other online applications. As such, learning in Second Life needs to be informed by the established best practice recommendations and theoretical underpinnings of both forms of delivery.

Behaviourism, cognitivism and constructivism are all theories of learning relevant to this project but Second Life can also be driven by both a post-modernist and critical theory theoretical framework. To attempt to adhere to a strictly constructivist, post-modernist theory of learning and worldview can be both disingenuous and undermine the educational potential of Second Life.

What is suggested is that behaviourism informs, at least, the “learning Second Life” components of the pilots (didactic learning might be the most efficient way to get students up to the desired competencies), whereas a constructivist approach can increasingly guide the subsequent pilot specific activities with a focus more on *role* playing rather than *rote* learning. A clear understanding of the theoretical frameworks of those involved in the SLENZ project is valuable both for team dynamics and to inform design and delivery that is consistent with the espoused theoretical framework(s).

Situated learning requires meaningful, realistic activities i.e. the learning has to be understood as useful outside the virtual environment. It also requires significant opportunities for discussion and time, with perceived learning from online courses directly related to the amount of discussion actually taking place in them. This aspect may be compromised due to the short time allocated to these pilots although subsequent courses may provide a richer, more meaningful experience.

Educators need to plan for the time and activities required to get students to a stage where they are comfortable enough in Second Life to start constructing meaningful knowledge relevant to the course they are studying. Clearly, the more Second Life-literate the student is, the richer the learning that can potentially take place. Both teachers and students need comprehensive orientation training prior to starting Second Life educational activities. It is suggested that as a minimum students need to complete points 1 and 2 of the Second Life Core Skills Competency Framework.

Individual learning styles and personalities are likely to impact the responses of students to the activities. Accounting for these differences should be built into the design, recruitment and delivery processes and cultural aspects also need to be considered. Some students for example, may be alienated to the idea of using Second Life if they have been previously taught that work and play do not mix (Vogel et al, 2008).

Existing approaches to online learning design are relevant for designing for Second Life. At each stage, the virtual world environment means that extra questions need to be considered and answered.

The starting point for the design of the learning activities will be to understand both the students' and the learning outcomes. Agreeing the details of learning activities will come next and Second Life offers new opportunities and challenges here. It may be beneficial to supplement inworld activities with others in real life or other online environments to achieve the desired learning outcomes. The third step is finding, customising or building resources. Testing these with users is important as is rethinking the activities and builds where necessary in response to user feedback.

There are no guidelines on how to design, manage and construct the required resources in Second Life in a coherent and systematic fashion. A realistic method for the development needs to be established when coordinating several developers and users and working to a tight time-frame. In particular, it will be important for the developers to be responsive to user feedback and to welcome changing requirements.

The project will use the principles of Agile development methods, particularly those of Extreme Programming (XP) to guide the development of a suitable process. This will allow for iterative development of the resources and will enable the pilot educator users to play a full and on-going role in the design and evaluation of the pilot activities.

2. Introduction

This literature review has been designed to help examine the potential for the creation of useful and meaningful learning activities within MUVES such as Second Life. A key aim of the review is to answer the questions: what are the actual and potential educational activities that Second Life uniquely provides or enriches; and what is important to consider as we design and develop resources for and support learning experiences in Second Life. This review is the first step in an 18-month project to investigate the use of Second Life to enhance New Zealand tertiary students' learning. It will provide a foundation on which the project's pilot studies will be built. This review, together with these pilots and their evaluations, will add to the growing body of knowledge in this young and emerging field.

In terms of a traditional literature review, this report may well be lacking in both rigour and timeliness. Almost all educational work in this field is less than two years old and very little has yet been published in established journals. Even that which has been published is often somewhat out-of-date by the time of publication as the technology and software which is the foundation for MUVES is itself changing rapidly. Attempts to produce robust and significant research findings through solid academic process are therefore often somewhat doomed. Much of the timely and relevant information is to be found either in conference proceedings, self-published online reports or in the blogs of those educators active in the field. Consequently, much of the literature is anecdotal and only peer-reviewed in the sense that it can become the focus of debate and discussion for the active education community. The SLED (Second Life Educators) list is a good example of the on-going peer debates being generated.

One consequence of this situation is that much of the literature around the educational use of MUVES in general, and Second Life in particular, is coming from the group of educators who are at the forefront of the experiment and who, not unexpectedly, have an inherent belief in the value of what they are doing. Countering this, some members of the educational community, fuelled by some of the more sensational reports in the popular press, find it difficult to see any value at all in the new technology (Eduserv, 2008). The ensuing tension is reminiscent of the early debates on the value of the web to education when early adopters had only a fuzzy vision but a clear belief that

the web would change the way we both teach and learn and others were hesitant to experiment with a new and untried technology. The middle ground, providing objective measures of the efficacy and quality of learning in MUVES, is currently missing from the literature but it has to be recognised that this will only emerge as the field matures. While the few peer-reviewed articles specific to Second Life have been included, almost all work in the area is experimental and untested.

As a result it is necessary to look not only at the non-peer reviewed work of the leading educators and observers in the field but also to be informed by that literature which, while addressing other aspects of online learning, may nevertheless provide some useful pointers and guidelines to the current work. Here, though, terminology can confuse the issue too. For example, Weller (2002) comments on multi-user virtual environments and, as we now consider Second Life to be a MUVE, it would seem natural to see his comments which pre-date Second Life, as nonetheless being relevant. However, this is not necessarily correct and great care needs to be taken to verify what is really being referred to in such publications.

Nevertheless, despite its apparent uniqueness, in the sense that it gathers together a set of features that differentiate it from other MUVES, Second Life is an online application and is being used as an adjunct to more traditional e-learning activities. Therefore, the previous literature on e-learning design, styles, activities and virtual communities will hold relevance to this project and is therefore covered in the review. Indeed, throughout both this review and the wider project the question of how and where and if Second Life provides additional value to education is the guiding principle. In order to address that question it is clearly necessary to contextualise Second Life.

The review thus covers a number of areas which the project team considered both necessary to inform the debate around this question and, to explore the debate further, relevant to building activities within Second Life. The characteristics of MUVES and Second Life are examined, particularly in terms of their educational potential. Learning theories, learning styles and virtual communities are addressed and linked to some existing educational activities in Second Life. The design of learning activities for use in Second Life draws on the literature for designing successful online learning and the process by which such activities are constructed is informed by work on IT systems development. In some respects the construction of learning activities in

Second Life may be seen to be similar to the construction of ‘serious games’ for learning. Therefore gaming theory and the design of online multi-user games has also been considered.

This review will, in itself, be out-of-date by the time it is widely viewed and it is accepted that the team will need to remain aware of new possibilities and challenges as the project progresses. The need to adapt to changing circumstances will be a constant pressure for the team and may be necessitated by changes in the Second Life software itself or by the technical infrastructure that supports it. However, building on shifting sand holds its own set of problems and the need for some solid ground on which to begin building is clearly essential. The recommendations arising from this review, based on both the formal and informal literature will provide the platform from which the project will grow.

3. Multi-User Virtual Environments

Multi-user virtual environments, sometimes referred to as virtual worlds, is the term currently used to describe a persistent 3D graphical environment accessed over the Internet which allows a large number of simultaneous users to interact synchronously. MUEs have developed from the rapidly-evolving field of computer games and can trace their origin from the simple, single player, text-based games of the 1980s through to the massively multiplayer online role-playing games (MMORPGs) such as World of Warcraft. As Anna Peachey has pointed out, as computer games have become more visually dynamic and stimulating and particularly more collaborative, so they have become of increasing interest to educators (Peachey, 2007). Even as the education community was first seriously considering the use of MUEs, IBM was identifying how successful play in World of Warcraft could lead to the development of sophisticated leadership and strategic thinking skills (GIO, 2007).

Although the term MUE has been previously used to refer to various types of online games, the term is now most commonly used to describe those persistent environments which are not ‘games’ as such, but rather support the establishment of virtual communities who may or may not choose to engage in role playing or gaming activities. Second Life is by far the most well-known and sophisticated of these generalist ‘worlds’, although there are others such as OpenSimulator (OpenSim, 2008), There (There, 2008) and Project Wonderland (Sun, 2008). The Eduserv Autumn snapshot for 2008, which surveys the use of virtual worlds among UK tertiary educators (Eduserv, 2008) identified that while Second Life was still the most popular educational MUE, others were also now being investigated. Currently, however, Second Life is the preferred MUE for education. The ability to create complex environments and objects, the relative sophistication of its graphics and consequently the ability to create rich immersive environments together with the relative low cost of entry (free to students and those who do not wish to directly buy “land” from Linden Lab, the creators of Second Life) continues to make it the most attractive proposition for educators.

An indication of how corporations see the potential of multi-user virtual environments can be seen in the fact that IBM plans to install OpenSim on all its servers (Linden, 2008). This will greatly increase inter-operability functions in virtual worlds, a

crucial step in their development, and boost the potential for educational institutions to set up their own virtual worlds, linked or standalone. It will also enable institutions to overcome the arbitrary Second Life bar on students younger than 18-years-old which can hamper delivery in some courses. However, OpenSim is still only in the alpha stage of development and while some of the functionality of Second Life has been replicated it is still very much in its infancy.

Virtual Learning Environments

As with other technology-driven fields, definitions in the rapidly-evolving field of e-learning are often contested. Although this review treats e-learning as synonymous with online education and web-based instruction (WBI), the use of the term virtual learning environments (VLEs) can cause confusion, as it can range from relatively static systems that track learner progress and allow staff to upload resources to the MUEs described above. Generally, the term virtual learning environment refers to “a software system designed to support teaching and learning in an educational setting” (Wikipedia, 2008a). This includes Learning Management Systems, such as Moodle and WebCT/Blackboard, as Wikipedia continues, “A [virtual learning environment] will normally work over the Internet and provide a collection of tools such as those for assessment (particularly of types that can be marked automatically, such as multiple choice), communication, uploading of content, return of students' work, peer assessment, administration of student groups, collecting and organising student grades, questionnaires, tracking tools, etc” (Wikipedia, 2008a).

However, it can also include the construction of specific virtual learning spaces which would be expected to have the following characteristics:

- A virtual learning environment is a designed information space.
- A virtual learning environment is a social space: educational interactions occur in the environment, turning spaces into places.
- The virtual space is explicitly represented: the representation of this information/social space can vary from text to 3D immersive worlds.
- Students are not only active, but also actors: they co-construct the virtual space.
- Virtual learning environments are not restricted to distance education: they also enrich classroom activities.
- Virtual learning environments integrate heterogeneous technologies and multiple pedagogical approaches.
- Most virtual environments overlap with physical environments.

(Dillenbourg, Schneider, and Synteta, 2002)

Although never designed as virtual learning environments, multi-user virtual environments do satisfy the definition of virtual learning environments above, which is no doubt one reason why some educators have seen the potential to use MUVES to enhance their teaching. In particular it seems likely that MUVES' abilities to provide rich, immersive, collaborative environments and facilitate easy social interactions may hold some promise for those learning activities which are enhanced by realistic simulation, meaningful role-play and wide-ranging communication. After all, that is in many ways what such virtual worlds were designed to provide.

Second Life

While Second Life can be considered as a 3D, immersive, virtual-learning environment, it has not been specifically designed as such and is more correctly termed a multi-user virtual environment and will be referred to as such in the remainder of this document. Nevertheless, a large number of educators and educational institutions around the world, particularly in the US and the UK, are now investigating and using Second Life as a teaching platform. Some examples of these will be provided later in this review.

Although Second Life's creator Philip Rosedale, had initially conceived of Second Life as an objective-orientated game, by the time it was launched in 2003, this perspective had evolved into a user-created environment for the development of and sharing in collaborative experiences (Au, 2008a). As a result, Second Life is a simulated environment rather than a game, although it may also be considered a 'game engine' in that games may be, and are, constructed within the Second Life world. De Freitas (2006) explains that simulations attempt to represent reality, in contrast to the clear fantasy environment of most games. However, any virtual world will have some element of fantasy and Second Life does not attempt to constrain itself to the boundaries of simulating reality alone. Consequently, avatars, the representations of the players, are able to fly, teleport from place to place and radically alter their appearance in a few seconds.

Participants enter Second Life via their 'avatar' which can be customised from a straightforward, semi-lifelike representation to a complete fantasy creation with all aspects of the avatar's appearance easily changed. The experience of those who have 'played' Second Life suggests that many players will have a wardrobe of avatars from

which they will choose the most appropriate for the activity they are currently engaged in. It is not uncommon for one individual to wear a professional avatar for business or educational activities but a non-human avatar for socialising, e.g. a butterfly, a cat, a mermaid or a character from Star Trek.

The range of activities in Second Life is extremely wide and many have been created to support specific communities of interest or practice. These may range from fantasy role-playing communities to businesses and government agencies developing a presence to support their information bureaucracies. Some companies have experimented, not usually successfully, with the use of Second Life as a means of providing on-line shopping, although there is a vibrant economy for goods built and traded solely inworld.

The president of the management consultancy Gronstedt Group SL (Gronstedt, 2007) has identified the following:

- that the highly respected Gartner Group estimates that 80 percent of active Internet users will be in non-gaming virtual worlds like Second Life by the end of 2011.
- that IBM is investing millions of dollars in a number of Second Life islands, and that other major companies are also investing in Second Life, e.g. Sun, Dell, Intel, Adidas, Toyota, GM.
- that hundreds of universities, including Harvard and INSEAD teach classes in Second Life for credit.

However, the claims of some enthusiasts for Second Life need to be verified. While it is true that hundreds of universities do have a presence in Second Life, it is less common for Second Life classes to be accredited. University administrators, in general, whilst keen to have a presence to exploit the potential of Second Life, remain cautious and unconvinced of the added value for wholesale utilisation in teaching and learning although the most recent Eduserv report suggests that that may be slowly changing (Eduserv, 2008).

More frequently Second Life appears to be used as an adjunct to teaching (Eduserv, 2008). The protected virtual environment is ideal for users to engage in a less inhibited manner than they might do otherwise and anecdotally it is suggested that many students find the environment highly engaging. Multiple personalities can be projected through the pseudo-anonymity inherent in having more than one avatar and the ability to use your real name or invent your own. The learning or development of tacit or explicit knowledge may depend on one's willingness and motivation to enter

into the spirit of the environment or, in other words, Gibson's (1984) 'consensual hallucination'.

The Strengths of Second Life

In some respects, bulletin boards may be considered similar to Second Life as both allow for asynchronous communication and both reduce race, gender and age discrimination through lack of face-to-face interaction. In addition, both shift power to the digitally literate, thus risking resistance or non-engagement from less technically proficient students and especially educators. Both are ideal vehicles for andragogic (an educational approach for adults characterised by learner-centredness) experiential learning through the breaking of traditional teacher-student hierarchies. However, Second Life is differentiated from other such web-based media by both the richness of the 3D graphical world that is created and by the ability of individuals to customise their appearance and behaviour to interact with this world. Thus, Second Life may be both more fun, and more 'engaging' than other online environments. It is certainly suited to developing a sense of immediacy, shared experience and emotional closeness.

One of Second Life's qualities lies in the opportunities it provides to socialise via alternative egos. This can lead to strong emotional ties to the avatar itself and also provides a rich opportunity for engaging role play. The variety of communities can be intimidating for some, but for the socially (and technically) confident they can become an important part of their lives. It has been argued that this element of social inclusiveness is "much more important in web-based instruction than in distance-education courses for learners to feel or perceive that they are a socially integrated part of a virtual community and that they have a sense of contact in the network" (Jung, 2001, p. 531). Is it possible to hypothesise that the reactions to Second Life will depend largely on how comfortable students feel in their interpersonal encounters? The use of avatars in Second Life may also empower those who are currently marginalised by society for their looks or physical abilities.

For those who insist that the avatar is merely a tool to access information and interact, it is possible to supply students with pre-built avatars as, in fact, Linden provides for all avatars when they first appear in Second Life. While providing pre-built avatars may partially democratise the group, it is noticeable that almost the first action

learning desired by new Second Life entrants will be characterised by questions on how to change and individualise their appearance. Requiring students to remain in their initial pre-built form may be counter-productive and hamper rather than foster the feelings of engagement with the environment. In addition, those who have previously participated in on-line gaming will continue to have a considerable advantage over real “newbies” in the tribal Second Life environment. As with all technology, multi-user virtual environments have the potential to marginalise those with low-IT literacy (Salt, 2005). With Second Life constantly adding more content, it is important to recognise there is a spectrum ranging from those who see Second Life as more about identity through avatars and networking, to those who want to use the avatar purely as a tool through which to acquire knowledge, such as language learning, with the appearance of avatars being less important.

The other clear potential for Second Life and the other virtual learning worlds is with the distance education students. Almost a quarter of New Zealand’s tertiary sector students study at distance (Anderson, 2005), India’s Indira Ghandi National Open University has 500,000 students, with the Open University of Hong Kong boasting more than 400,000. With English language ability a prerequisite for entry to many institutions the potential for Second Life to cater to these students is immense. Although Second Life is largely an English-language environment, it is possible to build a world for any linguistic community (there are several well-designed German, Italian, Spanish, Portuguese, Japanese, Korean and Chinese language creations for example). The popularity of Second Life to distance students is, of course, largely dependent on the credits awarded to the experience by the home institutions, unless a Second Life qualification becomes valued in itself. However, Anderson (2004) makes the important observation that students enrol on distance education courses for temporal, rather than spatial freedom i.e. the ability to work when you want, rather than being a means to work remotely. Too much emphasis on synchronous participation in Second Life may constrain this independence and limit its appeal. In addition, Song, Singleton, Hill, and Hwa Koh, (2004) found the following principle constraints with online learning: “technical problems, a perceived lack of sense of community, time constraints, and the difficulty in understanding the objectives of the online courses as challenges” (p. 59). These are issues which need to be borne in mind when Second Life educational activities are constructed.

Fung, (2004), investigated Hong Kong distance-education student reactions to face-to-face and online learning. The survey found that overall students expressed a slightly greater dislike for the online environment. With students evenly split on whether “online learning can enhance learning” (mean 2.54), it is important not to underestimate the challenge in convincing students of the merits of Second Life over the traditional face-to-face learning.

In order to benefit from the temporal and spatial freedoms of multi-user environments, however, it is vital that students can access Second Life from their home PCs, or that students have access to adequate campus facilities. Problems in these two aspects negatively impacted a recent New Zealand tertiary sector educational pilot (Parsons, Stockdale, Bowles and Kamble, in press). Their development and testing of a framework for Second Life education is of particular value for conceptualising the elements to consider in the design and development.

Jung’s (2001) investigation of transactional distance theory’s relevance to web-based instruction identified the areas shown to be significant for effective web-based instruction. Structurally, key elements are content expandability, content adaptability and visual layout. Successful web-based instruction encourages learner autonomy, collaboration in a non-rigidly structured environment that encourages dialogue, reflection and the construction of knowledge that is meaningful. When looking at the uniqueness of Second Life, it is worth noting Jung’s insights into the uniqueness of web-based instruction in general:

What [web-based instruction] offers that is unique among communications technologies, is the facility of combining the attributes of each of the other media, and thus provide a learning environment in which texts, pictures, video and audio are integrated into one system, access to huge databases is simple and easy, and more flexible interactions - especially asynchronous learner-learner interaction - are far simpler than before (Jung, 2001, p. 526).

For transactional distance theory to be useful in informing the design and delivery of Second Life learning, it is necessary, first of all, to reflect on the similarities and differences of Second Life and web-based instruction. Second Life relies heavily on the user having both a high-specification computer, particularly in terms of its graphics capability, and access to a reliable, high-speed bandwidth connection. Without these, the Second Life interface which is constantly being developed and improved, can offer a very different experience from more fluid and facile web-based

instruction media and difficulties may also be experienced with audio and video technologies. This can impact the collaborative experiences and development of communities of practice, lauded as the essential strengths of good online learning. Visual attractiveness has also been shown to be important in producing meaningful learning and the varying quality of the “inworld” builds and technical infrastructure might impact student reactions to the experience.

The use of avatars and the identity issues this produces again makes Second Life different, raising the question of whether it requires a new theoretical framework. The SLENZ project should shed valuable light on this aspect, as the design and delivery of the project is informed by the existing research on effective online learning. The evaluations will be able to probe if this is appropriate and possibly suggest a tentative revised theory specific to Second Life.

Some concerns have been expressed about the sexual content of Second Life which is certainly present for those who care to find it. Just as with other online environments, issues around adultery and sexual behaviour do exist and it is perhaps a reflection of the highly engaging environment of Second Life that it appears more real to some commentators than other equivalent online activity. Dr Munwah, a psychologist from Berkeley University, believes that Second Life activity “out of wedlock” is tantamount to adultery: “This is a situation where you have to be withdrawing some of your energy from [your wife] and your family in order to pursue another relationship. You wouldn't feel comfortable doing that in the real life, and it may not be skin-to-skin, but you're still doing essentially the same thing.” Aside from issues of adultery, Munwah admits she finds Second Life fascinating. “It is a very interesting area in terms of psychology. Because of the barrier the virtual world creates, people feel less inhibited and will experiment with experiences and personality traits they would not normally consider. The real question this leads to is, which relationship is more honest? The real world where people are often embarrassed to say what they really feel or the virtual whose mask allows relationships to develop uninhibited?” (McNamara, 2008).

The key point here is that Second Life can directly impact real life and is not a “game”. It is designed by and for adults, with a separate Teen Second Life available. With the haptic technology currently being developed for Second Life and other virtual learning environments to enable electronic pulses to contract muscles to

actually give the feeling someone is touching you, emotional blurring of the real and virtual worlds is only going to get more complex. As will be discussed later, authenticity is central to effective learning and Second Life clearly is regarded as emotionally authentic by many residents.

There is undoubtedly a steep curve when learning to participate in Second Life which can be a barrier to both educators and their students. However, for students it can be seen to lead to increased IT literacy, a key deficiency identified by employers. At a minimum, engaging in Second Life will enhance understanding of personal computer specifications and provide practice in downloading and Instant Messaging, with the more ambitious likely to improve their skills in programming and using audio and video streaming. It also seems likely that as members of a technological society, both staff and students will need to be increasingly active in the virtual worlds of the next generation of Internet applications, the 3D Web and learning some of the culture, customs and language of that new ‘country’ may well be useful in itself. This active learning is seen as highly effective, as outlined in the section on learning styles.

Ever since the “no significant difference” research there has been a lively debate on the relative merits of face-to-face and e-learning (see Joy and Garcia, 2000 for an overview of the complexity of the issue). Basically, the superiority of e-learning can be neither proved, nor disproved, with issues such as content, teacher preparedness, infrastructure, institutional strategy, student support and delivery, rather than the medium being the decisive factors. Jones and Bronach (2007) have found that 3D virtual learning environments enable a richer and more satisfying experience than web-based instruction delivery while offering the same level of satisfaction and interaction as the face-to-face course. The design and delivery, however, need to ameliorate the challenges for both tutors and students in encouraging students to be more self-directed in the less linear virtual world.

3D virtual learning environments are also seen as an ideal match for situated learning but they can also support the acquisition of content-thick, positivist knowledge, with regions in Second Life for example such as “Blacklibrary” (part of Hyperborea) providing links to academic and literary web sites in an engaging manner which overcomes the difficulty of reading text in Second Life. This will allow Second Life to support thorough academic research through links to full-text articles and books on

the web. Blacklibrary includes a research centre with books on shelves that when touched lead to learned papers on the web about Internet studies.

The immersiveness of Second Life itself is a rich source of learning activities. The content and process of engagement boast a wealth of opportunities to construct knowledge and activities can be embedded across curriculum. Both synchronous and asynchronous, Second Life has the flexibility to accommodate diverse learning styles and cultures. Potentially, it gives the learner a great deal of autonomy, which is likely to increase the all-important motivation to participate, especially if it is seen as fun and meaningful. The high drop-out rate for online courses of up to 50 percent (Dickinson and Stewart, 2001) can partly be explained by the design and delivery of the course not being meaningful, enjoyable and empowering.

Recent surveys

NMC 2007

The New Media Consortium's 2007 Survey of Educators in Second Life (based on 209 respondents) indicates some of the strengths and issues associated with undertaking education in Second Life. These findings should be viewed as indicative rather than conclusive, due to both the small sample and being a year-old in a rapidly developing environment (NMC, 2007).

A number of interesting points came from this survey including that women comprised 52 percent, with 82 percent of respondents more than 35-years-old. A third of residents operate more than one avatar, which raises issues connected with identity. The most positive experiences were "rich interactions, meeting new people, expanding networks, generosity of community" (45 percent), followed by "education events, teaching / learning in Second Life" (28 percent). The worst reported experiences in Second Life concerned technical issues/ using Second Life (36 percent), followed by grieving/abuse (33 percent). However, 58 percent reported that they had expanded their professional network and increased collaborations.

In terms of the educational potential of Second Life, the leading responses were for role playing (65 percent), artistic expression (65 percent) and simulation activities/scenario based training (57 percent). Interestingly, only 29 percent regarded it as having a high potential to teach full courses. Second Life is regarded more as engaging and interactive rather than easy-to-use or realistic. The survey findings also

stress the need for adequate mentoring and support for navigation and how to access and use audio and video. Built-in voice communication, essential for effective language learning, is now realised. While unlikely to be effective, the call to reduce the sexual content of Second Life is especially pertinent to education environments and institutions may feel it necessary to develop policies and procedures to deal with this, such as, students signing a liability waiver, or using closed island spaces. However, this would then create a tension in the sharing of resources with other educators – which would become closed content - and the serendipity that marks a large part of interactions within Second Life.

Ortiz de Gotari 2007

A larger survey of all residents, not just educators, sheds further light on the activities undertaken in Second Life (Ortiz de Gortari 2007). This survey was based on 657 responses. These respondents were predominantly male (60.3 percent) and significantly younger, with more than three-quarters less than 44-years-old. Another significant finding is that almost half claim to engage in cybersex. Not surprisingly educational use was less prevalent among this cohort.

Vogel et al. 2008

Vogel, Guo, Zhou, Tian, and Zhang (2008) conducted a study involving Hong Kong and Dutch graduate students to compare Second Life to a range of other group support technologies to gauge their collaborative capabilities, vital to successful construction of meaningful knowledge. Based on the 48 (55 percent) returned surveys, after three weeks of participating via email, online forums, videoconferencing, Second Life and MSN, Second Life ranked lowest in the way it was perceived in terms of usefulness, ease-of- use, team attitude, and perceived team attitude, when compared with: email, forums, video conferencing, and MSN. It came off the bottom of the rank in perceived team enjoyment: in “Fun” it came third out of the five and in “Pleasant and Enjoyable” it came last. These results may not be surprising given the applications with which it was compared, and the likelihood (not reported) that the students would already have had greater prior experience with the other forms of technologies. Indeed, comparing email with Second Life seems a somewhat fruitless task. Nevertheless the results are disappointing particularly given the Second Life space that was provided for the inworld activities:

The Alpine Executive Centre, located on the Meeting Support sim in Second Life, was used in 2007 to support HKNet. Within an alpine ski village, surrounded by snow-covered mountains and tucked away deep inside the mountain, lies an advanced meeting facility where real-world activities take place in a virtual environment. A main amphitheatre is accessed via a train that goes deep inside the mountain complex or by a walk along the frozen ice skating pond, or by teleport from the visitor landing area. An auditorium supports large groups in plenum for presentations and moderated discussions. A host of additional facilities exist to support teams. For example, teams can meet at one of the ten gathering spots around the Alpine village, including mountain huts with interactive screens and scenic lookouts. Participants also have opportunities to explore, shop, play, go ice-skating or just have fun together riding the chair lift and using the timed down-hill and slalom ski runs (Vogel et al, 2008, p. 14).

How can email, forums, video-conferencing, and MSN outshine Second Life? The first thing to note is that students were surveyed after three weeks' experience with their chosen medium. Second Life has a steep learning curve, unlike the much more familiar alternatives and there is no indication given of how much support was given to students in their use of this new medium. Perhaps a survey conducted later would have elicited different results. "Second Life fared particularly poorly on all measures" (Vogel et al, 2008p. 16). At first glance this seems a very negative statement but is perhaps more alarmist than seriously negative. Part of the reason for these findings may lie in the general difficulty of loading and using the software. At the time of the study, Second Life was updated weekly although this is no longer the case. However, due to its technological innovation, it does place high demands on bandwidth and is prone to more frequent crashes and poor performance, than more established technologies. This may prove to be a problem for distance students in New Zealand, particularly outside the major centres, where broadband users face poor line linkages, contention problems, bandwidth caps and quota allocations.

The Second Life interface also did not appear to be particularly intuitive. As one participant noted, "*We could only change dressings, walking around and always get lost in it, I can not control it* (italics in original)" (Vogel et al, 2008, p.20). However the authors do hint at the uniqueness of Second Life, accepting that perhaps it would be fairer to judge it against other measures that get at the "sense of presence". The opportunity to construct identities and become intimately involved with real people through these guises can be transforming and needs to be studied further. The authors

also speculate that some Chinese have been taught that work and play do not mix and consequently these students may be alienated from Second Life. Again, these cultural aspects need to be accounted for in the design and delivery of Second Life learning activities.

EDUSERV 2008

The Eduserv 2008 survey of the use of virtual worlds in the UK's higher education institutions covers the period July 2007 to October 2008. This "snapshot" revealed that approximately three-quarters of universities are utilising Second Life in some form, with less engagement in the medium by further education colleges.

Second Life is being used to support learning in psychology, research methods, IT, film production, multimedia, performing arts, fashion, language learning, education, archaeology and mathematics. Library involvement with Second Life is much less in the UK compared with the USA. Other uses of Second Life are for displaying student projects, developing alumni networks and promoting the higher education institution. Having a presence in both Second Life (over 18 years of age) and the Teen Grid was seen as necessary for the recruitment of prospective students.

Funding is most commonly from internal higher education institution sources, although an increasing number of external grants have been accessed. Staff devoting their time remains the main driver. Academics are aware of the deficiencies of Second Life and open to utilising other MUVES should they prove superior.

A significant change from previous years is that the Second Life contributors are increasingly working in teams rather than in isolation, evidence both of the growing number of academics involved and institutional support to enable the establishment of working groups.

Higher education institutions generally support the technical infrastructure requirements for Second Life, but have continuing problems with firewalls, voice chat functionality and inadequate PCs.

Attitudes to Second Life remain "ambivalent", ranging from strong support to scepticism and even hostility from a minority of academics and higher education institution managers. The time required to develop the requisite skills to participate effectively in Second Life was the primary negative aspect captured in the survey, with technological difficulties also widely reported as constraining its utility.

Improvements to the search engine were also sought. The creativity, collaborative opportunity that it affords and the strength of social presence were the most cited positive aspects (Eduserv, 2008).

Words of Second Life Caution

A Second Life project at the University of Kentucky (Antonacci, Thomas, Gerald, Lamoureux, Hollingsworth and Noakes, 2007) identified seven major challenges: technology, support, faculty development, legal issues, mature content, learning curve and cost. Some of these issues are covered below, together with other warnings of issues that may cause problems in the development or use of Second Life as an educational environment.

The UK's Open University has produced a wealth of literature on distance education, which is not surprising given its pioneering focus and large capacity. One experienced, enthusiastic online tutor advocates a flexible, imaginative, eclectic approach to learning (both didactic and constructivist), incorporating multi-media. However, his words on virtual worlds ("multi-user *simulation* environments") are a cautionary pause for thought. Despite praising the collaborative and identity aspects, Weller (2002) also points out that avatars can be "off putting" and undermine the trust vital to successful collaborative learning as "anonymous" avatars "grief". However, it is important to remember that Weller is not referring to the current generation of MUVES, or to Second Life, as his words predate its launch. Weller also identified the danger of a course becoming focused on mastering the controls (i.e. playing the game) rather than on the identified learning outcomes. The time needed to climb Second Life's "steep learning curve" makes this a real challenge to overcome, requiring "a strong pedagogic framework that emphasises discussion and analysis" (Weller, 2002, p. 137).

For practitioners, paying attention to lurkers so that their "legitimate peripheral learning" is valued and does not result in a critical mass of apathy undermining the formation of a collaborative learning community, is vital. This was the unfortunate experience of Hong Kong students participating in Second Life, who concluded that "genuine discussion had rarely occurred" (Fung, 2004, p. 139).

Löfström, and Nevgi (2007) have identified that reactions to web-based education vary considerably, all of which may be relevant to Second Life. Students faced

loneliness and technical frustrations while teachers liked it, but needed more time. Most significantly, teachers thought students were learning more than the students themselves did. Teachers and students seemingly harbour quite different perceptions as to the value of facts in education. For example, only five percent of students believe facts to be important to learning compared to 20 percent of tutors. This tension might explain some of the resistance to online technology from both tutors and students as the content and delivery does not match their different philosophies.

Research has indicated that virtual learning environments can facilitate superior educational outcomes to traditional classrooms. Students in the virtual class spent 50 percent more time working with each other than their counterparts in the traditional classroom (Schutte, 1997). Other academics are quite opposed to the notion (see Brook & Boal, 1995). Annand (2008) found the majority of 109 students surveyed preferred the traditional printed material over the e-version. Delwiche (2006) recommended instructors using Massively Multi-player Online Worlds (MMOs) should warn their students about the possibility of becoming addicted to the game.

Tertiary sector adoption of virtual learning environments is further constrained by it not being sufficiently cost-effective. Despite the massive growth in online education in general (Slone, 2008), many institutions shy away from greater involvement in virtual learning environments due to the costs of training tutors to effectively facilitate and the additional IT staffing infrastructure expenditures (Annand, 1999).

Linden's data shows year-over-year growth of 146 percent in millions of hours used by their users, with over a million users logged in over the last 60 days (Renaud and Kane, 2008). However, Second Life is in some ways a victim of its success and capacity could be reached, at the time of going to press, with less than 80,000 members online. Rescheduling classes is rarely an option, so the potential of being unable to meet in Second Life needs to be factored into the design and delivery of courses. Institution wariness to support the accreditation of courses that utilise Second Life stems from concern over unreliability of connection, insufficient broadband access, exacerbating the digital divide and limited examples of precedent.

Currently many of the educators active in Second Life would seem to be comfortable with creating their own educational resources. However, this can be problematic for some as Bateman (2007) said: "Second Life shines when there is an object or place

that can be shown to students, as seeing a large 3D object can be beneficial (sic) however, if an object of a desired topic does not already exist, creating one will take time” (p. iii). Clearly, there will be an increasing need for specialist Second Life ‘builders’ and already a community of experienced developers is emerging. The services of such developers will, in the future, add to the overall cost of significant builds in Second Life. We believe SLENZ will avoid these constraints as it includes sufficient technical expertise and dedication to undertake any significant building itself. However, it is likely that having a non-technical educator as an active member of the development team may well be beneficial.

Summary

MUVes, of which Second Life is currently one of the most sophisticated and mature, are being widely investigated by the international education community for their potential use as a learning environment. Rigorous research in the area is scant and can be out-of-date by the time it is published but reported experiences seem to vary widely. Some of those differences may be attributed to a lack of student or educator preparedness, a lack of clarity about the type of learning that Second Life can best enhance, and cultural inhibitions or a lack of an appropriate technological infrastructure. Nevertheless, conceptually the ability to create rich immersive experiences and engaging collaborative communities would seem to hold a promise that some educational activities at least could well benefit from this technology. The construction of a virtual learning community is already well underway as educators within Second Life collaborate, share and cooperate with those with whom they would have had no connection previously. In the same way, students are likely to benefit from those same kind of networks; both those already established by their teachers but also by those which they create themselves. Anecdotal, this is already beginning to occur on the NMIT island of Koru, where students from at least three ITPs in New Zealand are following each other’s progress with interest and learning by each other’s failures and successes.

This research treats multi-user virtual environments like Second Life (which has the potential to be more face-to-face than other virtual learning environments) as a sub-set of both e-learning and face-to-face teaching and as such is informed by their respective best practice recommendations and the theoretical frameworks which underpin them. Although, it is possible that the uniqueness of multi-user virtual environments

may require the development of a new theoretical framework, it is to the existing frameworks of learning theory that this review now turns.

4. Second Life and Education

The range of educational experiences currently operating or being planned or constructed in Second Life is extensive. Therefore any attempt to provide a comprehensive snapshot is unlikely to be successful. The Eduserv Foundation conducts regular reviews of UK tertiary education involvement with MUVes, and this is probably the most authoritative and up-to-date report. However, this captures only the involvement of UK educators. There is no equivalent snapshot for the US community which is by far the most extensive although some of that information, together with Australian initiatives, is captured in the Second Life in Education Wiki, compiled by Jo Kay and Sean FitzGerald (Kay and FitzGerald, 2008).

The purpose of this section is to identify some of the discipline areas and some of the ways in which Second Life is currently being used for education in the belief that this will provide further insights into the potential and limitations of the medium for tertiary provision. However, learning spaces and activities in Second Life are both dynamic and volatile and things may appear or disappear literally overnight or change significantly in a short space of time as new ideas are tested or new content is included. Consequently, any 'builds' mentioned in this section may no longer exist when this review is published.

Kay and Fitzgerald (2008) have developed a list of categories which they believe represents the educational activities of Second Life and which would seem to cover the full range of learning theories discussed previously. They also comment:

The unique qualities of a 3D virtual worlds can provide opportunities for rich sensory immersive experiences, authentic contexts and activities for experiential learning, simulation and role-play, modelling of complex scenarios, a platform for data visualisation and opportunities for collaboration and co-creation that can not be easily experienced using other platforms.

They then go on to identify that Second Life is used to support both distance and flexible education and includes such activities as:

- Self-paced Tutorials.
- Displays and Exhibits.
- Immersive Exhibits.
- Role plays and Simulations.
- Data Visualisations and Simulations.
- Historical Re-creations and Re-enactments.

- Living and Immersive Archaeology.
- Machinima construction.
- Treasure Hunts and Quests.
- Language and Cultural Immersion.
- Creative Writing.

It is interesting that with the possible exception of self-paced tutorials, these activities are likely to encourage or emphasise situated or experiential learning. However, Kay and Fitzgerald (2008) identify that training and skills development is an important category and this is likely to have at least some elements of behaviourism.

Kay and Fitzgerald (2008) also identify discipline areas represented in Second Life and again they cover a broad range including art and music projects, computer programming and artificial intelligence, literature studies, theatre and performance art, language teaching and practice, politics, commerce, architectural design and modelling and urban planning. This wide range of activities would seem to be confirmed by the latest Eduserv report (2008) which includes comments from educators actively teaching in areas such as computer programming and engineering, a range of creative skills including music, drama and film-making, information management, and healthcare. One interesting report on a historical build is from the Theatron project where Coventry University, "...is building 20 theatres from throughout history on Theatron Island in Second Life. These will be used as venues for a range of activities involving performance, theatre studies and creative writing (Eduserv, 2008. p. 12).

Medical and Healthcare

Educators in the medical and healthcare areas appear to have been keen to explore the potential of Second Life, particularly in relation to acquiring and practicing some of the "softer" skills required. Role play and simulations both seem to be used fairly widely. Antonacci and Modaress (2008) have designed a virtual medical clinic, but note the "steep learning curve" for students that reduced the time available for learning course material. They also commented that the ability to design the simulations may also be constrained by the age of students, observance of Linden protocols (such as gaining permission to access sites for class use), and the technical requirements. Other health sites are the University of Kansas Medical Centre and Heart Murmur Sim which allows residents to tour a virtual clinic and test skills at identifying the sounds of different types of heart murmurs. One particularly

compelling experiential build is the virtual hallucinations project which seeks to educate people about the schizophrenia. On entering the building the visitor experiences audio and visual distortions based on the reported experiences of two specific people undergoing a schizophrenic episode. The effect is unsettling and informative.

St George's Hospital in the UK also reports on the use of Second Life for the creation of paramedic training;

We are developing problem-based learning scenarios for Healthcare students in Second Life. This is a 15-month project, from January 2008. The problem-based learning scenarios are for Paramedic and Clinical Management students.

At SGUL our focus is on the Paramedic scenarios, which are developed using a 'virtual patient' model. Virtual patients are web-based resources that test students' clinical decision-making. We have created five different Paramedic scenarios for the students to work through, collaborating together in small groups. All scenarios start with call to scene, with some basic dispatch information. The students are then able to interact with the scenarios in a variety of ways: they can ask the patient basic questions, they can assess different parts of the body, and they can use any object from their Paramedic kit (replica of a Paramedic kit in real life) to assess, diagnose and treat the patient. The scenario ends with decision on if/how to transport the patient to hospital, and a handover at hospital. (Eduserv, 2008 p.11).

In New Zealand too, Scott Diener at the University of Auckland is creating a simulated hospital emergency room where small teams of medical and nursing students will collaborate to diagnose and treat a patient requiring emergency treatment (Diener, 2008).

Hospitality and Tourism

Virtual tourism and hospitality training seems another favoured area. While there are any number of builds and even whole islands dedicated to specific tourist destinations, for example Ayers Rock (Uluru), virtual Morocco, Amsterdam and Dublin, there are also those where the ambience of a partly real life area can be experienced. For example, Kamimo, which is an educational island created by a consortium of Scandinavian universities has a distinctive Norwegian ambience and Koru, the island owned by the Nelson Marlborough Institute of Technology (NMIT) in New Zealand, has been specifically built with native flora and is intended to provide an impression of New Zealand.

In 2007, the School of Hotel and Tourism Management (SHTM) at the Hong Kong Polytechnic University (PolyU), created a virtual campus in Second Life called Polyusotel. Penfold (in press) outlines the range of educational settings available to students in Second Life:

Visits can be made to virtual hotels such as Starwood's Aloft, InterContinental Hotel's Crowne Plaza Virtual Meeting Place, and the Rixos Hotel and Resort islands. Travel companies have also set up shop in Second Life – TUI and STA have islands, where visitors can take tours of the virtual world and also book real life holidays. Conference and event companies are opening virtual conference and exhibition centres in Second Life, and there are a number of fascinating locations for field trips including Frankfurt, Copenhagen, Barcelona, Galveston, Casablanca, Mexico and elsewhere. Educators have designed eco-friendly islands, and created simulations of the effects of global warming and rising oceans (Penfold, in press).

The project team opened a second island in Second Life and over a 6-month period built four hotels, a conference centre and a corporate yacht for use with hospitality and tourism subjects. Four Hong-Kong academics chose to use this medium for some of their classes in the spring semester 2008. Before the classes, students attended one or two workshops in a computer laboratory to familiarise themselves with using Second Life.

Time limitations and technical issues, specifically lack of facilities and technical or other support were the two major challenges faced by the teachers in using Second Life. This is confirmed in other studies from Antonacci and Modaress (2008) and Sanchez (2007). The finding that tutors wanted technical support available to assist them, which might be resisted by administrative staff and managers, should be noted. The lesson is that the more support provided in these early years, the greater is the chance of the long term effectiveness and attractiveness of MUVes to more than just the “early adopters” (Rogers, 1995).

Penfold (in press) conducted a survey of 152 students from the four pilot classes, which provided some perspectives on students' views of using the virtual world. When asked whether Second Life added interest to their studies, the response showed that 57 percent of students overall found it interesting or very interesting while 24 percent were neutral. Penfold explains:

However, for the virtual field trip only 40 percent found it interesting or very interesting, with 34 percent neutral, and the remaining 26

percent uninterested or bored. For the role play activity 55 percent of students found it interesting, 21 percent were neutral, and 21 percent found it not very interesting. Our conclusions are that the guest-room design created more engagement and a sense of satisfaction with a demonstrable outcome. The virtual lecture and demonstrations were more passive activities for students, but in a familiar environment. However, the role play and field trip were more unpredictable, open-ended, less structured and both experienced technical problems during the activities. Further study could be made to compare Asian students with Western students to see if there are any differences in perception towards the type of activities experienced based on active and passive learning styles.

The questionnaire also asked students for their perceptions of how well Second Life assisted their learning. Students responded that the strong points of Second Life were that it was fun, it was interactive and it aroused learning interest. Conversely, the weak points identified by the students were that it wasn't that effective in gaining knowledge, and that it didn't improve collaboration or cooperation. The author considered that the low response for collaboration was somewhat surprising and concerning as it questioned the assumption that Second Life is a good environment for collaborative activities.

The teachers involved saw the most important benefits of Second Life as those related to its ability to provide students with more interactivity and enjoyment of their learning experience. The author also commented that both teachers and students need more orientation training with the teacher tutorials undertaken prior to starting classes.

Language Acquisition

The potential of virtual learning environments to facilitate language acquisition and cross-cultural understanding has long been recognised (von der Emde, Schneider and Kötter, 2001) and Second Life offers some real opportunities not only for language classes per se but also to interact informally with native speakers of target languages in a collaborative way that is ideal for developing communicative competence. Of course this is heavily dependent on the reliability of the steadily-improving audio technology available in Second Life.

The tourism findings are very similar to the University of Tennessee's use of Second Life for four Spanish language classes, where 22-40 percent were neutral about it. About half the students reported technical problems, with a similar number,

recognising how much they learned, stating they enjoyed the tasks, as it was interactive (Larsen, 2008).

Another community resource for language education is the 'English Village' intended as a place where language teachers from around the world can come together to "create community and collaborate as they explore the possibilities of teaching languages in Second Life" (Kay and FitzGerald, 2008). English Village provides both learning spaces and teaching tools for language teachers and makes significant use of 'holodecks'. Taking their name from the Star Trek TV series, holodecks are pre-built scenes which can be brought into existence or swapped at the click of a button by the teacher. They provide a range of different scenes that can be used for role playing. Some of the scenes currently available are a restaurant, a bus stop, a hospital scene and a post office.

Business

Kay and FitzGerald remark that as Second Life has a real economy and currency exchange it is possible "to experiment with running businesses and engaging in economic modelling in a low-risk environment" (2008) and they comment on Singapore's Nanyang Polytechnic, which offered a "class in 2006 in which students used Second Life to design a commercial game and its business model, and implement and test a demo of this game".

The Standard and Poor's Index of 500 leading companies in the US is available as a useful resource for inworld business students providing realtime 3D visual representation of the index. Despite resources such as these, and the potential to run, market and manage small businesses in Second Life, the examples of business education are sparse. Perhaps as real life companies begin to develop a business model for success in Second Life, business education will follow.

Science and Technology

There are a large range of projects which explore aspects of science and technology. Some of these are specifically educational builds while others, although created for pleasure or for general interest, can be used in a variety of educational contexts. The Steampunk Project is an ambitious teaching and learning adventure created by Megan Conklin at Elon University, North Carolina, where students answer important

questions about science and technology by participating in a historical game set in 19th-century England (Kay and FitzGerald, 2008).

Genome Island is an often quoted example of an innovative approach to science education and appears in the “Top Twenty” of educational builds in the SimTeach wiki (SimTeach, 2008). Created by Mary Anne Clark, Professor of Biology at Texas Wesleyan University, it was designed to explore the potential of an interactive laboratory environment. Clark (2008) comments on the artificial boundaries created by the problems of real-life class scheduling which typically separate the lectures from the hands on laboratory experience. She continues:

One of the challenges of college/university science becomes the meaningful integration of the two experiences. Virtual worlds offer the opportunity to eliminate the lecture/lab boundary by immersing students in an environment to be investigated. At Genome Island, that environment is populated with cats and chromosomes, flowers and fruit flies, mice and mixollamas (mythical creatures that started to be hippos but mutated somewhere along the way), each of which responds to a touch by acting out some principle of genetics (Clark, 2008).

The publicly accessible island hosts a large number of interactive objects including “about forty sets of experimental objects that generate analysable data. Others are primarily informational, although the information they provide can be used for comparative purposes (Clark 2008). The objects on the island are intended to be used and re-used in a number of different activities by both students and researchers and although initially designed for use by entry level (first year undergraduate) students they are by no means restricted to only that group. Clark goes on to describe three particular activities, one of which is primarily informational although it provides ‘a striking illustration of how genomic organization contributes to species differences’ (Clark, 2008).

Another experimental activity is a reconstruction of one of Mendel’s classic experiments “where green peas are crossed with yellow peas and the progeny of the hybrids can be followed for several generations” and, as Clark explains:

because keeping track of the numbers is important in these experiments, the traits expressed by each pea appear in the Second Life chat record. Data from the chat record can then be copied and pasted into spreadsheets (provided) or other documents for analysis. The results of breeding experiments that would otherwise take many months to perform can be collected in less than an hour.” (Clark, 2008).

Architecture and Interior Design

The potential for designing and building immersive 3D spaces has appeal to those disciplines for which the fast realisation of a working prototype is valuable. Both architecture and interior design can benefit from this and Kay and Fitzgerald (2008) report on two such projects. One is the “Virtual World – Real Learning! Project” at Gipps TAFW in Victoria, Australia. Here students undertook to “interpret and respond to a client brief” to redecorate a room in the client’s house and the student, the client, the house and all interactions were in Second Life.

Second Life can provide some valuable experiences for architecture students too:

Second Life can be used to create fly-throughs of houses for sale, prototype architectural designs, as well as checking out hotels and other accommodation before you book. Montana State University's Creative Research Lab, directed by architect Terry Beaubois (Tab Scott in Second Life), in collaboration with the School of Architecture utilised Second Life to teach architecture classes and investigate novel methods for the design of a sustainable community for the West Oakland revitalization project. The student team worked both remotely and locally and met and worked both in person and in Second Life (Kay and FitzGerald, 2008).

Literature and the Creative Arts

One of the earliest and most impressive collection of builds has been that of the Literature Alive project created by Beth Ritter-Guth and Eloise Pasteur.

The self-proclaimed goals of the project are to:

...help faculty create ethical and immersive learning environments that provide "added value" to students in composition, professional writing, and literature courses: to help students use the resources of a 3D world to add to the depth and breadth of understanding literature; to foster a community of open access educators dedicated to the sharing of teaching content through the Open SLEDware Project; and, finally, to promote a lifelong love of learning through a lifelong passion for reading (LitAlive, 2008).

The project consists of a number of learning environments constructed to provide an immersive experience of the literature. One of the best known examples is that of Dante’s Inferno which again is publicly accessible. Visitors are led down through the seven levels of Dante’s vision, the stones speak to them, the lava boils and “at each level Dante’s description of it and his nominations for its inhabitants are there to read.

Visitors are then asked to nominate their own inhabitants drawn from history, current affairs or fiction and to explain why” (Atkins, 2008).

Another literature project is located in the Second Life version of Knightsbridge which is designed to represent real world 19th Century London with the houses modelled from real life. The British Literature Classroom is located in one of these mansions and by interacting with objects in the house, particularly paintings and furniture, students receive course material, including syllabi, assignments, activities and a selection of study texts.

The creation of machinima, which combines the use of 3D video-games and virtual worlds, with real-world filmmaking techniques to create animated films shot within Second Life, plays a role in a number of the educational activities but is for fairly obvious reasons particularly used by film and performance students. Kay and Fitzgerald (2008) explain:

The Second Life platform offers great tools for creating machinima, including the ability to build customised sets and stages for the action to take place, customisable avatars to play any character imaginable, and scripting and building tools to create interactions, gestures, props and effects. Using machinima techniques in Second Life offers some fantastic opportunities for students to explore the production of multimedia by making their own films. The low-costs associated with undertaking these tasks, plus the suite of tools available on the platform allow students to create their own content quickly and easily, whilst learning a range of skills including writing scripts, storytelling, storyboarding, film editing and production, team management etc.

The Australian Film, Television and Radio School, under the leadership of Gary Hayes, has used Second Life machinima widely in its course and has recently announced a postgraduate one year diploma in Virtual Worlds (Directing).

Training and Skills Development

A number of learning spaces have been created to assist students with the acquisition of life and employment skills such as interview training. One such recently-reported project initiated by Ken Hudson, of Loyalist College’s Virtual World Design Centre, based in Ontario, Canada, introduces students preparing to train with the Canadian Border Services Agency to some of the real life activities they would face. The students role play as guards interviewing drivers in a simulation of the US/Canadian border which has been built in Second Life. The programme director stated that the

students "gained confidence from the experience, and that they had a competitive advantage for job placement over others who did not have the experience" with students' average test scores improving an average of 28 percent. (Au, 2008b). This simulation provides a level of immersive experience for students that would be almost impossible to provide in real life. As Wagner James Au commented, "The alternative to this Second Life-based, VOIP-enabled simulation of the US-Canadian border, I suppose, is a costly real world simulation (booth, working gate, actors, cars, etc.) (Au, 2008c)"

Summary

The descriptions have been chosen to highlight the range of activities and diversity of educational areas that already exist within Second Life. As the number of these builds increases, almost all of which are freely accessible, the opportunities for utilising and building on the work of others grows too. Any educator may take a class of students to visit Ancient Rome or the living ecology of the island of Svarga or Dante's Inferno. There are also many examples both in Second Life and on the web of collaborative and supportive communities of educators. The SimTeach Second Life education wiki (SimTeach 2008) has begun to collect educational tools and resources, including suggested lesson plans, for use in Second Life and inworld, both the International Society for Technical Education (ISTE), dedicated to K-12 education, and the New Media Consortium (NMC, 2008), a consortium of almost 300 learning-focussed organisations, have established support networks for Second Life educators. The examples described in this section can be seen to have some common characteristics. Most have constructed some form of enhanced-reality space in which immersion and engagement with the environment are emphasised. These kinds of environments would seem to provide a number of opportunities for experiential or situated learning to take place and a number of role-playing simulations are found. Some provide simulations that would not otherwise be accessible to students for reasons of history, geography, safety or real world constraints. Additionally Second Life provides a rich environment in which to extend the understanding and practice of many creative arts. These observations could well be useful in considering the types of activities with which Second Life may enhance the learning of adult students and will form some guiding principles on which to base the choice of candidates for the SLENZ project pilot studies.

This research treats multi-user virtual environments like Second Life (which has the potential to be more face-to-face than other virtual learning environments) as a sub-set of both e-learning and face-to-face teaching and as such be informed by their respective best practice recommendations and the theoretical frameworks which underpin them. Before examining the learner design and delivery of Second Life it is necessary to take a step back and provide an understanding of both established educational theories and more innovative approaches that address the potential uniqueness of multi-user virtual environments.

5. Theoretical frameworks

Behaviourism, cognitivism and constructivism can be viewed as the “holy trinity” of educational theories within which all learning can be analysed. However, this paper has attempted to highlight how Second Life is a unique learning environment and as such merits the inclusion of more innovative and less established theoretical perspectives. Therefore this section will introduce linguistic and socio-cultural theories, before detailing the actual and potential contribution of the established trio.

Salmon (2004) urges online innovators and users to “be explicit from the start about your instructional strategies and the ideals and values behind your use of online teaching and learning” (p. 178). This requires the specification of the theoretical framework in which you are operating. For example, “is this pedagogy or andragogy; are you a critical theorist or post-modernist?”

Linguistic and Socio-cultural Theories

No technology is valuable or politically neutral, and Second Life can be said to favour particular cultural assumptions or social norms over others. This section will touch on a few possibilities in the theoretical domain, some of it drawing from critiques of computer-mediated learning generally, others of Second Life specifically. As yet there is little literature relating social theory domains to online educational considerations and Second Life specifically.

Linguistic

Ironically, the technology that is proclaimed as revolutionising the deepest foundations of culture is rooted in this basic misunderstanding of language. This misunderstanding partly accounts for one of the most important oversights of computer-mediated learning: the symbol systems appearing on the screen reproduce the implicit thought patterns of the software programmers. [Where the programmers themselves are evidently unaware of what they are communicating] (Bowers, 2000).

Bowers in his book, “Let Them Eat Data”, wanted educators to consider a wider range of issues than simply the content designed for relatively narrow learning objectives. He wanted us to critically reflect on the whole experience that is implicit in the content and the interface, including the computer itself. His premise is that the designs and symbolism used to develop such technology and experiences represent a

linguistic colonisation of the present by the past, which is ultimately an ecologically unsustainable vocabulary and way of thinking about the world.

Cultural

While Bowers did not critique Second Life specifically, he did critique virtual worlds of the day. While they were not multi-user like Second Life they shared many similar characteristics and assumptions.

...the Sim series, like all other educational software, ignore other forms of cultural storage and renewal - such as elder knowledge and the need to develop symbolic forms of expression (music, dance, narrative, ceremony) that do not diminish the processes of Nature... [M]aking decisions that involve the use of modern technologies leaves (sic) the students without an understanding of the differences between ecologically appropriate technologies and those that are culturally imperialistic (Bowers, 2000).

It is MacCaw who connects his critical framework to Second Life in her 2008 article, *Art and (Second) Life: Over the hills and far away?*

Second Life is built upon, and relies on our fundamentally familiar relationships to landscapes and social interactions that occur within them (MacCaw, 2008).

MacCaw takes the connection further, relating aspects of Second Life to colonial era landscape painting, and with Bowers argues that virtual world's simulation heralds neo-colonial value propositions.

If land is not producing economic value then it is un- or under-utilised. Land and its use-value become synonymous with ownership.

Danny Butt in his essay on *Local Knowledge* (2005) proposes three impassable contradictions, related to settler culture, indigenous culture and location. One of these, mapping – the most basic function of the colonial process – Butt writes, functions by turning a profoundly social relationship with the land characteristic of indigenous culture, into data.

And while the designers of Second Life created a land conveniently without indigenous people, its first owner (the Linden Corporation who establishes initial trading rights for each 'new' island) and the Linden in-house building tools frame the world. I suggest that the way that we construct the formation of culture in this empty land draws upon a colonial model and precedents. The research question that follows from these initial considerations is: is it possible to have new empty land that allows for a different model of colonisation, or will older models prevail? And how can we consider art in this relationship? ([MacCaw, 2008](#)).

And finally to Bowers again, in his critique of another virtual world simulation, Story Book Weaver:

Storybook Weaver not only encourages the student to make decisions about the storyline, but also about the geographical features on which the story will be situated, as well as the animals, plants and types of buildings that will be part of the visual background... The 650 images and 450 scenery combinations that the program makes available to the student provide for a wide range of imaginative possibilities, and this is where the real problem arises.

What the creators of Storybook Weaver's view as the expression of students' creative imagination can also be viewed as extreme anthropocentrism. Rather than knowledge of specific ecosystems and cultural traditions (architectural styles, clothes, technologies, and so on) the student's subjective experience is the basis of learning (Bowers, 2000).

Bowers' and MacCaw's critical insights into virtual worlds offer us many points of consideration for education in Second Life and online generally. Linguistic, social and artistic theories are rarely related to online education theory, but what they evidently offer is new areas of thought that may offer new levels of sophistication in learning design.

Psychology theory

Online educators often lean to cognitivism and especially constructivism for theoretical grounding, while others advocate that online learning should be informed by both behaviourism and constructivism (Carr-Chellman & Duchastel, 2000). Instructional designers in distance or technology education face the challenge of reflecting a philosophical and methodological shift, from behavioural to cognitive perspectives and then from objectivist to constructivist perspectives (Huang, 2002). This "shift" implies that traditional teaching remains driven by the "sage on the stage" pedagogy, which is regarded by most writers as totally unsuited to virtual world teaching.

Ally (2004) argues that the three leading psychology theories that are applicable to learning (behaviourism, cognitivism and constructivism) all have places in online learning, due to their extensive overlaps. Blackall (2008) argues that all three are in action all of the time, and that while constructivism (particularly social constructivism) is the primary vehicle for learning generally, when in a formal education context – behaviourism is the primary vehicle. In this sense, when

considering the educational uses of Second Life we should take into account informal and formal learning possibilities, and consider the usefulness of more recent theories applied to learning, such as connectivism.

Riva & Ijsselstein (2003) provided us with a psychosocial theoretical framework with which to consider presence in Second Life. They formulated three categories of presence: social, physical, and co-presence. The perceived realism of the virtual experience depends on how convincing the physical environment is, the strength of common cultural frameworks and the extent to which the members of the community feel able to determine the actions of the group.

Cognitivism

Vyotsky's (1978) "zone of proximal development" continues to have significant influence in design for learning. This cognitivist concept uses the idea of short and long-term memory, where a finite amount of new information is temporarily held in short-term memory, and that events or activities are required for committing that new knowledge to long term memory.

Learning designers interpret this in different ways. Some believe that learners move through information and activities at their own pace, and require certain levels of consistency and prior knowledge - commonly known as "scaffolding". The Core Competencies previously mentioned can be seen as providing this "scaffolding".

Learning design that is informed by a cognitivist approach suggests information and activities should be "chunked", with five to nine items on a screen to prevent cognitive overload, with activities that maximise possibilities for deeper processing that may transfer information to long-term memory.

When designing online education materials and tutor involvement, it is important to provide a variety of activities, in recognition of individual cognitive differences. For example, the Myers-Brigg Type Indicator, a psychometric questionnaire designed to measure psychological preferences in how people perceive the world and make decisions, indicates that the synchronised activities of Second Life are more suited to people with extroverted personalities (Koper and Tattersall, 2005). This suggests that consideration be given to asynchronised activities that offer alternatives to Second Life's primarily synchronous experience, so as to support people with more introverted personalities.

The Kolb Learning Style Inventory can be used to establish a student's or trainer's cognitivist approach to learning. Examples of the learning styles are concrete-experience learners, reflective-observer learners, abstract-conceptualisation learners, active-experimentation learners, assimilators and accommodators.

As with all forms of adult education, an individual's learning outcomes from participating in Second Life are also directly impacted by the intrinsic and extrinsic motivation to participate. According to John Keller's ARCS Model of Motivational Design, there are four steps for promoting and sustaining motivation in the learning process: Attention, Relevance, Confidence and Satisfaction (ARCS).

ARCS should be considered in the design and delivery process. They are a useful and accessible reminder of some pitfalls to avoid and goals to strive for and aid in the identification of the strengths and weaknesses of Second Life. The extent to which these are met can also be investigated in the evaluation.

1. Attention: Attention can be gained in two ways: (1) Perceptual arousal - uses surprise or uncertainty to gain interest; uses novel, surprising, incongruous, and uncertain events; or (2) Inquiry arousal - stimulates curiosity by posing challenging questions or problems to be solved.

Methods for grabbing the learner's attention include the use of:

Active participation - Adopt strategies such as games, role play or other hands-on methods to get learners involved with the material or subject matter.

Variability - To better reinforce materials and account for individual differences in learning styles, use a variety of methods in presenting material (e.g. use of videos, short lectures, mini-discussion groups).

Humour - Maintain interest by using a small amount of humour (but not too much to be distracting).

Incongruity and Conflict - A devil's advocate approach in which statements are posed that go against a learner's past experiences.

Specific examples - Use a visual stimuli, story, or biography.

Inquiry - Pose questions or problems for the learners to solve, e.g. brainstorming activities.

2. Relevance: Establish relevance in order to increase a learner's motivation. To do this, use concrete language and examples with which the learners are familiar.

Six major strategies described by Keller include:

Experience - Tell the learners how the new learning will use their existing skills. We best learn by building upon our preset knowledge or skills.

Present Worth - What will the subject matter do for me today?

Future Usefulness - What will the subject matter do for me tomorrow?

Needs Matching - Take advantage of the dynamics of achievement, risk taking, power, and affiliation.

Modelling - First of all, “be what you want them to do!” Other strategies include guest speakers, videos, and having the learners who finish their work first serve as tutors.

Choice - Allow the learners to use different methods to pursue their work or allow choice in how they organise it.

3. Confidence: Help students understand their likelihood for success. If they feel they cannot meet the objectives or that the cost (time or effort) is too high, their motivation will decrease.

Provide objectives and prerequisites - Help students estimate the probability of success by presenting performance requirements and evaluation criteria. Ensure the learners are aware of performance requirements and evaluative criteria.

Allow for success that is meaningful.

Grow the Learners - Allow for small steps of growth during the learning process.

Feedback - Provide feedback and support internal attributions for success.

Learner Control - Learners should feel some degree of control over their learning and assessment. They should believe that their success is a direct result of the amount of effort they have put forth.

4. Satisfaction:

Learning must be rewarding or satisfying in some way, whether it is from a sense of achievement, praise from a higher-up, or mere entertainment.

Make the learner feel as though the skill is useful or beneficial by providing opportunities to use newly-acquired knowledge in a real setting.

Provide feedback and reinforcement. When learners appreciate the results, they will be motivated to learn. Satisfaction is based upon motivation, which can be intrinsic or extrinsic.

Do not patronise the learner by over-rewarding easy tasks (Keller, 2008).

Behaviourism

Second Life owes more to behaviourism (also termed instructivism) than might be expected given the prevalence of constructivism as the dominant theoretical framework for learning generally. Behaviourism posits that behaviour is determined by stimulus-response conditioning rather than thoughts or feelings (OERD, 2002). Programming is not a discipline that lends itself well to experimenting and self-interpretation. Most programmers learn their skills by principally following instructions and adhering to a prescribed path. The draft Second Life Core Competency Framework (Swaine, 2207) included at Appendix A specifies that it requires the acquisition of three sets of skills, which are likely to be most readily learnt through following prescribed, behaviourist approaches.

Similarly for users of Second Life, there is a considerable amount of prescriptive learning required before becoming relatively independent in the use of the software. This learning is arguably best achieved through direct instruction.

Behaviourism is still arguably the primary vehicle in which learning takes place in a formal education setting. Enrolment, administration, attendance, class, subject categorisation, teacher/student divisions, assessment, positive and negative reinforcement and many other aspects common to the formal education setting can easily be recognised as behaviourist instruments. To a large extent it can be expected that many of these instruments will be transferred into Second Life either directly or indirectly when formal education is the organising principle behind the learning design.

Constructivism

Constructivism is defined as “the co-construction of meaning in the learning environment” (Morphew, 2000). Contemporary learning theories posit that the learning designs most appropriate to higher education are those based on constructivist principles (Oliver, 2001). Mayes (2001) claims a consensus has emerged that the key theoretical underpinnings of online learning advocates constructivism, with meaningful, authentic activity undertaken collaboratively.

Constructivism, andragogy, action learning, transformative learning and situated learning are all forms of experiential learning, defined as “the process of creating and transforming experience into knowledge, skill, attitudes, values, emotions, beliefs and senses (Jarvis, Holford and Griffen, 1998, p. 46).

Constructivists believe knowledge is actively constructed by the learners, depending on many contextual factors. Online learning enthusiasts often cite constructivism or social-constructivism as their preferred theoretical framework, especially in the virtual learning environment. Ally (2004 p. 19) states:

In a traditional lecture, the instructor contextualises and personalises the information to meet their own needs, which may or may not be appropriate for all learners. In online instruction, learners experience the information first-hand, which gives them the opportunity to contextualise and personalise the information themselves.

This passage may be overstating the differences given the continuing need for expert guidance from the “sage on the stage”. Architecturally too, the Second Life virtual classrooms are often designed to look much like traditional classrooms, betraying a behaviourist philosophy, with learning materials more effectively distributed outside the virtual world.

Constructivists also advocate collaborative learning activities designed around peer-to-peer collaboration with the tutor being more of a facilitator. This can have the added value of improving the participants’ soft-skills in team-building and communication. Time to reflect on experiences is also needed to allow meaningful knowledge to be processed and constructed into a perspective. Activities that can promote co-creation of knowledge and personal reflection include that of keeping journals (Morphew, 2000).

The ‘community of inquiry’ is heavily stressed by constructivist online educators. Ethnographers’ research on tribes is valued as illuminating the process of building and maintaining this community, with trust and shared values clearly observable amongst the Second Life “residents” (users). Annand (1999) and Mason and Hart (1997) urge caution in overstating the community aspects of online education, with the digital divide and the low recruitment and retention evidence of obstacles and resistance.

Two leading writers on e-learning reveal their constructivist theoretical perspective when stating:

Changing practice requires practitioners to learn, specifically to alter their conceptions of teaching and learning through, e.g. opportunities to construct their own meaning; learning from experience through reflection, informal learning, problem-based learning, action-learning, peer-supported learning (Sharpe and Oliver, 2007 p.123).

This paragraph represents a shift away from scientific empiricism to post-modernism. There is a belief that meaning is constructed through the activity, and that authenticity and feedback influence the knowledge that is constructed.

Driscoll (2000) advised that constructivism required six conditions:

- Embed learning in complex, realistic and relevant environments.
- Provide for social negotiation as an integral part of learning.
- Support multiple perspectives and the use of multiple modes of representation.
- Encourage ownership in learning.
- Provide adequate time for learners' investigation and in-depth engagement.
- Nurture self-awareness of the knowledge construction process.

Constructivist activities tend to be based around tasks that are open-ended, problem-based and ill-structured (e.g. Boud & Feletti, 1997). They are process, rather than content-oriented, giving the learners greater ownership of the material and outcomes. Self-direction is suggested as effective in online learning and is consistent with adult education's andragogy.

Critics of constructivism might argue that a heavy reliance on social interaction and constructed meaning can lead to students feeling short-changed and de-skilled, and increasingly irritated by the tutor failing to provide answers or even clear direction. The vacuum created by the absence of an expert may in turn be filled by a student who is poorly informed. This is especially unsuited to "hard" science disciplines which depend on there being a verifiable truth rather than interpretations and perspectives.

Learning Theories

Typically, the term learning theory is applied to the three broad psychology theories listed above. For purposes of usefulness, we have elected to use the words learning theories to categorise a growing number of ideas that inform practice around teaching and learning specifically.

Learning Styles

Although the existence of learning styles may not be universally accepted (Willingham, 2008), it is still worth considering that Second Life, as a form of online education, may be more suited to people with certain communication preferences. A recent investigation of the e-learning styles of New Zealand tertiary students (Jeffrey, Atkins, Laurs and Mann, 2006) revealed a number of pertinent points:

- a preference for learning by listening (18.2 percent of students were high on this, 4.3 percent low);
- learning visually rather than by text (14.3 percent high, 33.4 percent low);
- working collaboratively rather than alone (14.8 percent high, 38.9 percent low);
- time poorness (13.8 percent high, 7.4 percent low);
- achievement motivation (29.1 percent high, 1.3 percent low);
- intrinsic rather than extrinsic motivation (39.9 percent high, 10.3 percent low);
- effort (18.2 percent high, 4.3 percent low);
- goal focus (46 percent high, 0.2 percent low);
- relativistic reasoning rather than factual (8.8 percent high, 28.7 percent low);
- dependent rather than independent learning (21.1 percent high, 22.8 percent low);
- and global rather than sequential learning (15.2 percent high, 24.4 percent low) (Jeffrey et al, 2006).

The preference for collaborative work is especially relevant for Second Life, with its constructivist, philosophical orientation.

Concrete experience, reflective-observation learners, abstract-conceptualisation learners, active-experimentation learners, assimilators and accommodators are some of the possible types of learners who need to be considered when designing learning materials and media (Ally, 2004). The synchronised activities of Second Life are more suited to extrovert learners (Koper and Tattersall, 2005) while more introverted learners might want to focus on the numerous asynchronous activities enabled in the virtual world. Synchronous activities could include role playing, exploring with others, debating, discussions, and even educator-delivered presentations or lectures, either in text or voice chat while asynchronous activities could include sending messages and documents to people who are not inworld, or working alone through a set of activities or games.

Hills (2003) has calculated the percentage of the United Kingdom and United States populations with the Myer-Briggs Type Indicator (MBTI) learning styles in order to

match the personalities with suitable e-learning activities. For example, the level of involvement in the process will influence the amount of praise to give and the extent of debate in the decision-making process.

It may be useful to bear the number of learner styles in mind when designing and delivering the activities. Indeed there may be no reason why different forms of activities can be built for the same content to allow for student preference in learning style. Practical considerations on how and what to design to accommodate differing learning styles are discussed elsewhere in this document.

Online Community

Developing the online community has been found to be more difficult than in face-to-face learning and must be consciously supported (Rovai, 2002). Successful online learning has been reported to lead to greater learner autonomy and critically, with the supportive virtual community, increasing retention (Fung, 2004). A key to success in developing a community is in the early online socialisation stages, which needs to be carefully managed by the facilitator.

Making online contributions more structured, pithy and compulsory may be necessary, even if this is contrary to hard-core constructivists and andragogists, with Fung (2004) stating:

To attract more students to participate, the provision of focussed and structured online discussion tasks by e-moderators appears to be essential. In order to maintain the discussion, perhaps students' responses also need to be specific and short (p. 145).

The extent of cultural identification with the other members of the virtual learning environment is central to the constructivists' view, with many (Rive *et al*, in press) lauding the powerful sense of co-presence and shared experience in Second Life. They deem it to be greater than that forged via the telephone, video conferencing or the video phone. In support of this Rive *et al*. explains, "In a telephone conversation it is common to ask, "Are you *there*?" and unusual to say "Are you *here*?" When using Second Life it is reasonably evident if the person you are about to communicate with is "*there*".

Collaboration in Online Learning

Curtis and Lawson (2001) found significant differences between face-to-face and asynchronous online interactions. While it needs to be borne in mind that Second Life is both asynchronous and synchronous, the research stresses the uniqueness of the online environment. The key findings concern the need for mentoring and effective support for novice online learners, especially for ice-breaking activities that allow students to invite each other to become friends. This Australian tertiary sector research also noted the online need for a more structured, overt clarification of learning goals, and the lack of “challenge and explain” cycles of interaction that are thought to characterise good interchanges in face-to-face tutorials.

Despite nurturing reflection, interest, deep processing and team-building, collaborative learning does not suit loners, and can lead to personality clashes, students leaving and feelings of group despondency rather than elation (Weller, 2002).

Situated Learning

Situated learning stems from constructivism. Supporting participants to construct their own meaning and recognising incidental learning on the periphery (chatting around the coffee machine or sending instant messages) is central to learning and should be nurtured and planned for. This is termed “legitimate peripheral participation” by Lave and Wenger (1991).

Situated learning requires meaningful, realistic activities. Linking the Second Life to real life requires the learning to be perceived as useful outside the virtual environment. It also requires significant opportunities for discussion and time, with perceived learning from online courses directly related to the amount of discussion actually taking place in them.

Situated Learning and Adult Education

Tertiary education involves all those in post-compulsory education, from age 16. Adult education is a discipline that focuses on those beyond their teens and twenties, with students’ average age mid-30s (Ouellette, 2000) and recognises the life experiences as providing unique opportunities and challenges. With 82 percent of Second Life residents engaged in education over 35 (NMC, 2007), the relevance of adult education theory and practice has a direct connection.

Andragogy is a key principle that informs the practice and theory of adult educators and students today. When e-learning writers refer to establishing a learner-centred, reflective pedagogy, they are in fact advocating andragogy, not pedagogy. Dickinson and Stewart (2001) have made this connection, explaining that the key features of successful online learning is “focus on the shift in the locus of control, the learner knowing that he or she is at the centre of the learning, with the teacher one facilitator of that process” (p. 196).

Situated learning is especially relevant to adult learners, seen as better able to interpret and elaborate their socially co-constructed knowledge in a community of practice than younger learners (Kimble and Hildreth, 2008).

Huang (2002, p37) has synthesised the major features of adult education and constructivism, which underscores their extensive similarities.

A “perspective transformation” (Mezirow, 1981) in how the world is viewed can be both the trigger for adults to seek lifelong learning and the cause of changed behaviour. The popular education tradition in adult education stresses the importance of reflection leading to action (praxis), most famously seen in the Brazilian adult literacy programmes (Freire, 1970).

Brookfield (2005) continues in the adult education tradition of emphasising the place that critical theory has in empowering the weak. However, use of constructivism (facilitating discussions) runs the danger of deskilling these vulnerable adults, contrasted with the traditionally-educated technocrats (lawyers, medical doctors IT specialists) who remain in power.

Distributed Cognition

Distributed cognition can be seen as another approach informed by the constructivist and cognitivist theoretical frameworks. Distributed cognition recognises that knowledge is built not only from the individual, but also the interactions with both others and objects (Hutchins, 1995). Distributed cognition is of value to problem-solving in designing and delivering e-learning and can be seen as a key aspect of Second Life possibilities, through the creation of objects and their interaction with others inworld, in ways which are impossible in real life.

Conole and Fill's (2005) learning design toolkit is informed by Laurillard's (2002) five principal media forms (Narrative, Communicative, Adaptive, Productive, and Interactive). The authors explain:

Narrative media tell or show the learner something (e.g. text, image). Interactive media respond in a limited way to what the learner does (e.g. search engines, multiple choice tests, simple models). Communicative media facilitate exchanges between people (e.g. email, discussion forum). Adaptive media are changed by what the learner does (e.g. some simulations, virtual worlds). Productive media allow the learner to produce something (e.g. word processor, spreadsheet) (Conole and Fill, 2005, p. 10).

Connectivism

Connectivism theorises that knowledge is distributed across networks and the act of learning is largely one of forming a diverse network of connections and recognising attendant patterns (Siemens, 2005). Connectivism requires agreement that knowledge exists in networks, and learning results from forming and navigating these networks. Siemens (2008, pp. 11-12) further explains:

Connectivism presents a model of learning that acknowledges the tectonic shifts in society where learning is no longer an internal, individualistic activity. How people work and function is altered when new tools are utilised. The field of education has been slow to recognise both the impact of new learning tools and the environmental changes in what it means to learn. Connectivism provides insight into learning skills and tasks needed for learners to flourish in a digital era.

When knowledge is seen as existing in networks, and learning as forming and navigating these networks, many existing aspects of academia are subject to change. First, teachers interact with learners and content in a different manner. The Internet has caused a power shift in classrooms, as learners now have greater access to information, experts, and peer learners. Secondly, instructional designers, due to the developing complexity of tools and availability of open education resources, play an educational role of directing educators to tools and resources. These two foundational changes, while presented here as a conceptual discussion and in need of additional experimentation and evaluation, may serve as levers for broader changes within the academy (Siemens, 2008 pp. 19).

Those points noted, it is good to recognise the importance of “know where” not just “know what and how” in the digital world.

Educational Theories and Second Life

Behaviourism, as a classic stimulus-response model enshrines the traditional, didactic teacher-led approach to learning, with students as novices, passively absorbing expert knowledge. For Second Life this would entail the tutor explicitly directing students to develop proficiency in the commands required to control their avatars, and the subsequent turn-taking in prescribed activities. Quantifiable assessments can identify the resulting changes in behaviour. Behaviourist learning can thus be seen as akin to training such as acquiring the skills to undertake medical procedures or interview and “process” drivers crossing international borders as has occurred with the use of Second Life to train Canadian border police.

In contrast to behaviourism, constructivist principles give primacy to experience over "expert knowledge". The role of the teacher is to facilitate the development of an environment which nurtures a non-hierarchical community, capturing and valuing the generation of personalised interpretations of knowledge in unstructured settings. For Second Life, this would allow students to acquire the skills needed to participate by experimenting through trial and error. The activities would be co-designed and delivered by students, with the tutor learning as much from the students as vice versa.

Nurturing “legitimate peripheral participation” (Lave and Wenger, 1991) in Second Life involves understanding and accommodating the changing levels of involvement of students. Novice “newbies” may wish minimal communication of active involvement initially, comfortable to follow more experienced members and remain on the edge of the physical setting. In time, however, confidence may develop and the same student may wish to be actively involved. Allowing for students to volunteer themselves for more prominent tasks when they feel ready requires close attention to the evolving virtual class dynamics and the provision of activities that seamlessly allow students to take the roles that meet their current stage of development.

Cognitively, Second Life can provide various types of “scaffolding” to accommodate individual cognitive differences. As is the case with situated learning, each student will require varying amount of support, at varying times and the more options that are available, the greater the chance of meeting the needs between and within individuals. The “chunking” of items to alleviate information overload is also consistent with cognitivist principles. The administration of a learning styles survey and orientation

survey will help identify activities that meet the student personalities and cognitivist learning styles. The extent of role playing, anonymity, debates, collaboration and socialising needs to be appropriate to the various participants, bearing in mind that they will include a range of extrovert and introvert personalities.

Summary

In summary, behaviourism, cognitivism and constructivism (and related theories) will all continue to inform various ideas for teaching and learning practices, including online and in Second Life. Of course these theories are part of our interpretation and understanding of how education might work in Second Life. In this review however, we have briefly introduced a linguistic and socio-cultural frame for critically thinking about online learning and related design ideas. This critical frame is not typically applied to educational considerations, but could help to establish new areas of sophistication in learning design, covered in the following section of this review. Which theory should take centre stage depends on the context and intentions for learning. Mindfulness of the perspectives that the theories aim to share with us, can only help our efforts in understanding, and designing for learning in Second Life.

6. Designing Learning in Second Life

Due to the lack of literature offering practical guidelines for learning design using Second Life, it is necessary to refer back to established literature relating to e-learning. In this section, we consider a range of recommendations available to inform online education and discuss what they might mean for designing learning experiences in Second Life.

Context

Learning design begins with setting the context. This includes understanding both the desired learning outcomes and the students. Activities should have a clear purpose that acknowledge the realities of the educational setting and allow students to work on their own issues and engage with problems and challenges (Sharpe and Oliver, 2007, Alexander and Boud, 2001). Students benefit when the purpose of the learning experience and the advantages of the technology environment is communicated to them in language they understand (Sharpe and Oliver, 2007; Mason, 2001).

Bowers (2000) reminds us that in considering students' needs, we want to recognise cultural assumptions that sit within environments such as Second Life, which will provide challenges when seeking to 'take account of the language, values, cultures and priorities of their particular community' (Alexander and Boud, 2001).

Beetham and Sharpe (2007) agree the importance of understanding the students and their needs but also suggest that learning designers identify relevant principles and theories and how to apply them in the specific online environment, as discussed for Second Life in the learning theories section of this review. Along with constructivist theoretical frameworks, hermeneutics, fuzzy logic and chaos theory have been advanced as appropriate to inform instructional design and development in the information age (Akilli, 2007).

Activities

Critical elements in the design of online education are the learning activities, the learning resources and the learning supports (Oliver, 1999). Activities need to be designed before the resources and supports. Assessment should be integrated with the

course activities (Mason, 2001) and supported by anytime, anywhere feedback (Salmon, 2004).

The key to effective online learning is accounting for presence, immediacy, movement, artefacts and multi-modal communications (Jones and Bronack, 2007). Activities that maximise online learning require students to interact with, and respond to, one another and the teacher, and simulate rich environments (Alexander and Boud, 2001). Examples of Second Life activities have been described in Section 4 and demonstrate the potential for such activities within Second Life. As Californian Second Life educator Stan Trevena wrote: “We have to get away from thinking of Second Life as another place for people to live, and shift instead to thinking of it as a staging area for finite and well defined activities with our students” (The SLENZ Update, 2008).

Perez-Garcia and Warburton (2008) offer taxonomy of questions to help designers create positive learning experiences in Second Life which is included at Appendix B. They include questions not relevant to other online environments, such as, to what extent instructions for organising the client-user interface and camera controls will be given, or how avatars will move in the learning space. However, while the choices and implications may be different in a virtual world, many of their questions are relevant to other online learning environments, for example, how to prepare students technically, which media, communication methods and tools to use, and how to encourage quality communication, feedback and learning. When designing learning experiences that use Second Life, it may be beneficial to have some activities external to Second Life, for example, to add activities not possible in Second Life, to assess the learning, or to manage the risk that some learners have no or unreliable access.

Collaborative construction of meaningful knowledge requires students to acquire a level of technical competence, which is better suited to those with a high tolerance for ambiguity and stress (Löfström and Nevgi, 2007). The process of developing these “mind tools” (Jonassen, 2000) can in itself be collaborative.

Well-designed orientation activities can help students become comfortable enough in Second Life to start constructing meaningful knowledge. The more Second Life literate students are, the richer the potential for learning. The danger with using Second Life is that the focus of the course becomes mastering the controls (“playing

the game”) rather than education, especially given Second Life’s “steep learning curve”. This requires “a strong pedagogic framework that emphasises discussion and analysis” (Weller, 2002, p. 137).

Although Second Life is not a ‘game’ game theory is relevant to learning design in this environment. Game theorists, such as James Gee (2007), point out the educational benefits of games, both cognitive and social. In discussing these differences Adams and Rollings (2007) explain, “Games are different because the player’s actions are *not* supposed to be as efficient as possible; they are obstructed by the challenges of the game. Most games also hide information from the player, revealing it only as the player advances. A game’s user interface is supposed to entertain as well as to facilitate” (quoted in Greig, 2008).

Game theory is relevant to a student’s identification with their avatar(s). The Proteus effect has been observed, whereby an avatar’s appearance affects its behaviour and experiences: for example, taller avatars facilitate more aggressive behaviour inworld compared with shorter counterparts (Yee, Bailenson, and Ducheneaut, in press). A possible response could be to have avatars “off the shelf”. However, a mixture of “off the shelf” and customised may impact the educational interactions. This has implications for the design of activities and the resources to support them, as well as the teacher’s role as facilitator.

As a non-game MUVE, Second Life offers users many choices, such as, the appearance of their avatar, or where to visit, that may overwhelm some and engage others. The orientation activities will need to consider how best to support users through their different responses to these choices.

The emphasis on human contact, evidenced in the UK’s Open University’s survey of online learner needs, raises the question of the extent to which virtual worlds such as Second Life offer the equivalent of human interaction. Second Life is a medium for synchronous activities and can be highly social, thereby satisfying the human contact requirements of online learning. However, at present, avatars are limited in their facial gestures. Monitoring student involvement in activities and effectively intervening to encourage and role playing in simulations may foster the desired active involvement. Lack of engagement may be caused by both personality traits and technical obstacles.

Resources

Resources are the content, information and resources with the underpinning knowledge and with which the learners interact (Oliver, 1999). Once designers agree what they believe students will do to learn, existing resources within Second Life need to be identified, and used or customised, or built. The seven universal design principles (Centre for Universal Design, 2008) can guide the design of these builds, i.e. develop builds that are simple and intuitive for others to use; have a clearly understood purpose; can be used equally by different learners, in a variety of ways without too much effort; and, even if users do not use them as the builder originally intended, they are still likely to succeed in learning. Designing for reusability is important for cost-effectiveness and as global citizens (W3C, 2008).

Greig (2008) identifies challenges in designing virtual spaces to support agreed activities. These include the challenges of how to design a virtual space to assist social networking or to make it easy for users to understand the purpose of different spaces and be able to easily achieve that purpose, and determining what makes it easier for users to work within a virtual space with which they are unfamiliar. These challenges have been faced by designers of physical spaces for many years. This in turn raises the question of whether an architect's input would add value during building virtual representations of physical spaces, and if so, how and when?

Beetham and Sharpe (2007) identify the challenges of knowing which solutions will best meet users' needs and of communicating effectively with developers and with users. They stress the importance of testing a design to make sure it can be developed, trialling developments with users to understand how well they work in practice and modifying activities and builds in response to what users say. Section 7 discusses how an iterative development process will support this.

Support

Supports include the schedules, scaffolds, structures, encouragements, motivations, assistances and connections used to support learning (Oliver, 1999) These can be provided through human interaction or well-designed resources. In an innovative environment, such as Second Life, two types of support appear necessary – support of educators who are not yet confident in the environment or of what it offers

educationally, and of students, both for their subject learning but also for help in navigating a new environment.

Changing practice requires educators to learn, specifically to change their own perceptions of teaching and learning (Sharpe and Oliver, 2007). They, therefore, benefit from opportunities to construct their own meaning and learn from their experiences. Educators need to develop their facilitation skills to be successful online (Mason, 2001). Salmon (2004) suggests training online facilitators online rather than face-to-face and to be clear on what they and their students will be expected to do. Salmon also believes that the facilitator should have experienced a similar course to the one they are about to moderate online and have completed a qualification at that level. She recommends using a novice, not an expert for a final training programme check, and giving the trainees time to familiarise themselves with the programme first. This seems relevant for preparing educators to facilitate learning in Second Life.

Online learners identified that they want support to pace their study, ongoing feedback, and access to human support not just technology – “in essence an ‘always on, broadband tutor’” (Salmon, 2004). Establishing a good helpdesk and online support systems and encouraging competent students to support others can address some of these concerns and reduce demands on facilitators (Salmon, 2004). Mason (2001) warns against approaches to supporting students that lead to “interaction fatigue” for facilitators.

Sharpe and Oliver (2007) recognised the importance of members of a learning community being supported by people with whom they can identify and who they believe share their concerns. Using students to “cascade” the knowledge and help build a community of practice can be effective. Designing Second Life experiences includes thinking about advice and instructions for students, conversational flow and communication dynamics between students and tutors, and how and when learners receive learning material (Perez-Garcia and Warburton, 2008).

Summary

Existing approaches to online learning design are relevant in designing for Second Life. At each stage, the virtual world environment means that extra questions need to be considered and answered.

The place to begin is to understand the context i.e. the students and the learning outcomes. Agreeing the details of learning activities comes next and Second Life offers new opportunities and challenges here. It may be beneficial to supplement inworld activities with others in real life or other online environments to achieve the desired learning outcomes. The third step is finding, customising or building resources. Testing these with users is important and rethinking the activities and builds where necessary in response to user feedback. In parallel, it is important to think about effective support that relies on both ‘physical’ and human elements.

Well-designed resources that clearly communicate to students the purpose of activities and the expectations of students and tutor, are easy to use and fit for purpose, are important for effective virtual learning and can decrease demands on the human support. The next section discusses how to develop such resources in Second Life.

7. Developing Builds in Second Life

It has to be recognised that the creation of a series of artefacts in Second Life is not substantially different, although possibly more complex, than the creation of any other set of digital elements for a computer application. Some of this complexity stems from the variety of elements that may need to be created and interconnected. In some respects, the design and development of Second Life activities may have more in common with the design and development of online games than it does with traditional IT development. As Michael Sellers has identified:

“Creating games is not like creating any other kind of entertainment product or software, and the production of online games is different from producing stand-alone single-player games. Unlike movies, successful games are decidedly non-linear and player-driven. Unlike other software, we have no user-tasks to model, as playing the game *is* the user’s task. Nor can most online games rely on players staying within the geographic, thematic, or plot-driven bounds we might set in a single-player game; the players will make up their own stories for the most part, provided we create for them a world rich and varied enough to support their imaginations (Sellers, 1997).

Learning activities in Second Life, while not games in the sense that Sellers is intending, nevertheless are likely to share a number of characteristics, particularly in the sense of being, partly non-linear and amenable to the ‘player’ constructing their own story from the objects in the activity. Thus the elements of such a build could include, complex 3D objects constructed from one of more primitives, each of which will require its own textures; each object may also require one or more pieces of embedded software (scripts) written in Linden Scripting Language (LSL), embedded information or instruction notecards, textures, other objects or sounds; the objects themselves may need to interact with each other in specific scripted ways; and an external database may be required. In addition to managing the creation and version control of such elements, a means of standardising such things as the naming of elements, the determination of ownership, and relevant permissions will be important for the smooth running of the final build. The need for some form of formal development process is clearly essential.

The IT industry has developed hundreds of formal development processes or methodologies, for controlling complex computer systems developments. Each has a distinct emphasis on some aspect of the development process and varies according to

the type of system that it has been designed to build. These methodologies range from the highly prescriptive and heavily documented methodologies of the waterfall approach such as Structured Systems Analysis and Design Method (SSADM) to the one-off, informal, trial-and-error approach of so-called ‘cowboy’ development (Avison & Fitzgerald, 2006).

The heavily prescribed approaches work well when: the user requirements are easily defined and recorded up front; communications between large teams of users and various kinds of technical developers is required; the speed of delivery is less important than rigorous testing and when the requirements; and the technology and the desired outcomes are well understood. They do not easily lend themselves to innovation, changes in user requirements or exploration of software potential. The ‘cowboy’ approach is characterised by an individual, idiosyncratic approach to development which is often appropriate when a single developer wishes to explore the potential of various solutions to problem situations which may be both ill-defined and volatile. Nevertheless, this approach can be problematic when a team approach is required and can result in uncontrolled resource use, a lack of standards and a less than satisfying end product.

In between these two extremes are a number of ‘agile’ methods which emphasise close collaboration and willingness to rapidly respond to changing circumstances, and the overarching need to work in close cooperation with the final users of the system. Although not generally considered a mainstream development process, the methods used in constructing computer games may also offer some useful techniques. In the absence of any literature in the area of building for Second Life, we consider it likely that the pragmatism and flexibility of an ‘agile’ development process, supported by techniques from gaming construction, are likely to best meet the needs of this project and will be the primary focus of the following section.

Agile Software Development

Agile methods are sometimes characterised as being at the opposite end of the spectrum from ‘plan-driven’ or ‘disciplined’ methods. This distinction is misleading, as it implies that ‘agile’ methods are ‘unplanned’ or ‘undisciplined’. A more accurate distinction is that methods exist on a continuum from ‘adaptive’ to ‘predictive’ Agile methods lie on the ‘adaptive’ side of this continuum.

The primary source of information on ‘agile’ development is the Agile Manifesto website which clearly outlines the principles by which ‘agile’ developments are guided.

“We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation
Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more” (Agile Manifesto, 2008).

A key concept in ‘agile’ developments is that of the team. Most teams comprise five to nine individuals and will include, as a minimum, one user or customer representative. Open, frequent and honest communication within the team, who are usually located in a single open office and between teams, is considered vital. Formal face-to-face meetings take place daily to facilitate such communication.

Key principles underlying the Agile Manifesto include:

- Customer satisfaction by rapid, continuous delivery of useful software.
- Working software is delivered frequently (weeks rather than months).
- Working software is the principal measure of progress.
- Close, daily cooperation between business people and developers.
- Projects are built around motivated individuals, who should be trusted.
- Simplicity.
- Regular adaptation to changing circumstances.

In support of these principles there are a number of Agile ‘best practices’ including a daily update of progress and a review of goals; short release cycles so that the latest builds can be quickly tested and returned for changes; a commitment to respond quickly and positively to the comments from the user or customer; and the use of generic skill sets that are common across the team, rather than relying on specific skill sets that are scarce (Wikipedia, 2008c).

Extreme Programming

Extreme programming is a relatively well-defined process under the general Agile umbrella which offers a clear and practical model to support the development of educational software (Dexter, 2007). Prominence is given to the need for iterative development, i.e. frequent small releases of software are provided so that errors or misunderstanding or new requirements can be quickly identified and built in; there is encouragement to use metaphor to clarify design issues; and there is a strong belief in the collective ownership of the system, between developers and customers, both during development and after completion.

The full Extreme Programming or XP process and its justifications can be found on the Extreme Programming website (XP, 2008) but some which differentiate it from most other development methodologies are a) the use of user stories; b) the way release planning is used to create the schedule; and c) the use of daily 'stand-up meetings'.

User stories largely, if not completely, take the place of the traditional requirements analysis documents and while related to the use cases of Unified Modelling Language (UML) (Use Cases, 2008) and to the usage scenarios of Rational Unified Process (RUP) (Usage Scenarios, 2008) they are totally customer-focussed and should be devoid of any technical considerations. They are created by the customers and are short (usually three sentences) descriptions of what the system needs to do to satisfy the customer requirement. These stories also drive the creation of acceptance tests for the software which must meet the requirements of the agreed story before it will be accepted as correctly implemented. In addition, developers use the stories to estimate how long each might take to implement, with an ideal time being one to three weeks. A collection of user stories is grouped to create a release plan and this in turn determines the schedule for the development.

The daily, stand-up meeting is one of the characteristics of Extreme Programming. Designed to bring people together for the shortest necessary time, usually around 15 minutes, it is a well proven means of keeping everyone in touch with the complete project development. Any issues which clearly require longer discussion are scheduled for separate meetings with only the required individuals present.

In terms of the actual design of the system, simplicity is considered the highest virtue and anything which can contribute to simplicity is encouraged, e.g. the use of a system metaphor to guide the naming of objects. Knowing the metaphor that is being used to describe the system can help developers guess what an object or script name may refer to and may help them to find pre-existing examples very quickly.

The use of Class-Responsibility-Collaborator or CRC cards is used as the primary means of design. This allows for good collaboration between team members. The Extreme Programming website points out: “The more people who can help design the system the greater the number of good ideas incorporated” (CRC Cards, 2008). Although used primarily as a means of identifying which objects interact and collaborate with others the CRC cards give a view of the complete design of the system interactions, both with the hardware interface and the graphical user interface (GUI).

Refactoring is another Extreme Programming characteristic. Refactoring is the process whereby even working software is constantly assessed for its efficiency and complexity. Whenever it is possible to simplify code, it should be done, in the interest of maintaining a simple system. This is often easier said than done, as developers can become attached to the designs and code that they have created. As the website reminds developers, “a caterpillar is perfectly designed to eat vast amounts of foliage but he can't find a mate, he must refactor himself into a butterfly before he is designed to search the sky for others of his own kind. Let go of your notions of what the system should or should not be and try to see the new design as it emerges before you” (Refactor, 2008).

Frequent and comprehensive testing, driven largely by the requirements identified in the user stories, is also a feature of Extreme Programming. All code must have unit tests and must pass those all those tests before it can be released. When a bug is found tests are created and acceptance tests are run often and the score is published (Wells, 1999).

Other Techniques

There are a number of other techniques that may have value in the creation of the builds for the SLENZ project. Statecharts (Crane and Dingel, 2005), a common tool in UML developments may offer some value, particularly if there is a need for any

complex coding as the formalism has a strong match with development in LSL, which explicitly presents states as a programming language abstraction. Statecharts are a very useful tool when developing realtime or embedded systems and it would seem that the development of scripts in Second Life may be closer to realtime embedded systems in their behaviour than other interactive systems. While Statecharts model the behaviour and interaction of objects, Sequence Diagrams, also from UML are used to model the procedural aspects of the system and also the required communication over time between objects. These two complementary techniques may assist in developing the overall system.

Storyboarding is another technique that is used particularly in the games design area that may be a useful addition to the development process for Second Life builds. “Storyboards are graphic organisers such as a series of illustrations or images displayed in sequence for the purpose of previsualising a motion graphic or interactive media sequence, including website interactivity” (StoryBoards, 2008). A storyboard is an informal collection of images which are an expression of everything that will be contained in an activity. Deriving, as they do, from the animated film industry, storyboards lend themselves best to linear activities, where the entire journey can be planned out in sequence. However, short storyboard sequences branching in the manner of traditional flowcharts can be used to express specific linear paths.

As yet, there does not appear to be any accepted method of implementing builds in Second Life. Each new project is likely to utilise different techniques that seem to show promise and which seem well-fitted to the particular build that is being developed. The choice of techniques will also be partly influenced by the type of learning activity that is to be implemented. The more emphasis there is on the social constructivist aspects of learning for example, the harder it will be to create one linear storyboard, although the construction of user stories around the different interactions that may take place could be useful. The emphasis in Agile methods, particularly in Extreme Programming, on customer involvement and the adaptation of both the development and the methodology when problems arise, suggests that following a form of this process may well be useful to the SLENZ project. Specifically, the full use of user stories, regular formal dialogue between developers and users, regular small releases for testing and the use of CRC cards to envisage the interaction of all objects within the system, could all be useful elements of the development process.

The value of other techniques for specific situations may well become apparent as the development progresses. One essential element of the final design process must therefore be the willingness of the design team to take on new ideas and not be constrained by the restrictions of a pre-determined methodology.

8. Conclusion

This review of relevant literature was never intended to provide a comprehensive consideration of all aspects and issues surrounding education, MUVES and Second Life. Instead it was intended to inform the SLENZ project team on some of the issues that would be relevant to the successful outcome of the pilot projects. In essence, these issues fell into three broad areas: the nature of MUVES, relevant teaching theories and creating appropriate educational activities and, as the review process progressed, various documents were created to distil practical guidance on activities that the project team was undertaking.

The first of these was the Request for Proposals (RFP) that was issued in September, 2008. It was recognised that a number of those interested in submitting a proposal for activities to be built in Second Life would have only a limited view of what it could offer. Clearly, Second Life and other MUVES share some commonality with other e-learning applications as well as providing opportunities for replicating face-to-face experiences for distance students. However, it was also found that the combination of the many strengths of Second Life created what may be currently considered a unique environment for bringing together a range of educational opportunities that could not be replicated elsewhere, either online or in the 'real' world. Information from the review was thus used to suggest possible types of learning activity that might be well suited to a MUVE environment and to provide relevant suggestions. The review also helped to establish the criteria which were developed to guide the project team in deciding which of the pilots were likely to provide a good exploration of the Second Life environment. The suggestions that were provided as part of the RFP are shown at Appendix C.

It was also clear that the design of useful and robust learning activities would require an agreed process based on best practice for the design of e-learning but which also considered good practice of a traditional classroom. A workshop which would bring together both the project developers and participants and other interested parties was identified as an important part of this learning design process and the guidelines and workshop outline is included at Appendix D.

One aspect of the project which initially had been less immediately obvious was the coordination of the Second Life developers. Once the need for an agreed

development process, together with a protocol for various technical aspects such as standard element naming, version control, releases and backups had been identified, a literature search revealed that it was one area that was not covered in the literature, not even in the more informal blogs and mail-lists. Drawing on the background of several of the project team, various software development methods were considered and the principles and elements of Agile development methods were suggested as a possible development and implementation framework. The process of designing and creating online games was also considered and various aspects, particularly storyboarding appeared to be promising additions. The relevant aspects considered in the review were combined to create an initial framework for the design and implementation of Second Life builds and this is included here at Appendix E.

A fourth output from the review is a list of recommendations of things to be considered when contemplating a major educational development in Second Life or other MUVE. Not all the recommendations are empirically based but those which are not have been gleaned from the advice provided and experiences described by those educators with first-hand knowledge of the issue of Second Life teaching. This set of recommendations is included at Appendix F.

All of these documents will have an important role in the overall progress of the SLENZ project. The first has already proved useful in informing the groups of educators who considered putting forward a proposal to the SLENZ team and the project team. The second will be the basis for the first two days of the planned workshop while the third will guide the technical development that will be required. The list of recommendations will continue to inform the project and are intended to provide the basis for a list of recommendations and best practice guidelines that will be part of the final outcome of the whole SLENZ project.

There are a number of limitations to this literature review, some of which were identified at the beginning and some of which only became clear as the review progressed. The scope of the relevant subject matter, the difficulty of finding timely empirical evidence, the rapid change of the technology and the ‘early adopter’ nature of the field all contribute to the difficulty of constructing a robust literature review. However, the journey of constructing this review has in itself been of immense value to the team. As a collaborative activity it has highlighted some of the strengths and difficulties of such an approach and the decision to seek frequent feedback from the

wider team has helped to keep all members informed. Overall, it has served its intended purpose of identifying actual and potential educational activities that are enriched by the use of a MUVE such as Second Life and highlighting those aspects of the project process that will need special consideration. As such, it provides an explicit foundation for the remainder of the SLENZ project.

9. Glossary of Terms

Avatar	A representation of a real person in an online environment. Avatars range from just a name and a photograph displayed on a bulletin board to a complex manipulated 3D object in a virtual world.
Asynchronous learning	An approach to providing technology-based training that incorporates learner-centric models of instruction in the sense that learning activities are initiated by the learner through the use of self-paced and self-directed modules undertaken when the learner is prepared and motivated to learn.
Blended learning	A learning environment in which two or more methods of delivery of instruction are used. A typical example would be a combination of technology-based materials and face-to-face sessions used together to present content.
CLEs	Collaborative learning environments are spaces, virtual or real, which facilitate the approach to teaching and learning that involves groups of students working together to solve a problem, complete a task, or create a product. According to Gerlach, "Collaborative learning is based on the idea that learning is a naturally social act in which the participants talk among themselves. It is through the talk that learning occurs." (Gerlach, 1994)
Instructional Design and Development	The practice of creating instructional tools and content to help facilitate learning most effectively. The process consists broadly of determining the current state and needs of the learner, defining the end goal of instruction, and creating some "intervention" to assist in the transition. (Wikipedia, 2008e)
Learning activity	<i>"A specific interaction of learner(s) with others(s) using specific tools and resources, orientated towards specific outcomes."</i> (Beetham, 2007, p. 28, italics in original).
Learning object	"Any digital resource that can be reused to support learning" (Wiley, 2000).
LMS (Learning Management System)	Software for delivering, tracking and managing learning. They can range from simple systems for maintaining records to software for distributing courses over the Internet and offering features for online collaboration.
MMO (Massively Multiplayer online game)	A game which is capable of supporting hundreds or thousands of players simultaneously which by necessity is played over the Internet. They are not restricted to personal computers and devices such as the Xbox 360 , PlayStation 3 , Nintendo DS host MMOs
MMORPG (Massively multiplayer online role playing game)	An MMO which incorporates a significant level of role playing within the game which takes place in a persistent online world with hundreds or thousands of other players. Each player controls an avatar which interacts with other players.

MUVE (Multi-user virtual environment)	Originally used to describe MMOs that were not game specific the currently defined MUVE will have 3D isometric/third-person graphics, will be accessed over the Internet, allow for thousands of simultaneous users to interact, and represent a persistent virtual world. The focus is often on social interaction rather than gaming.
Online education	The emerging field of online education is known variously as “knowledge media”, “distance education”, “distributed learning”, “technology mediated learning”, “telematics”, “resource based learning”, and “flexible learning” (Hughes, 2005).
Online learning	“The use of the Internet to access learning material; to interact with the content, instructor, and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience” (Ally, 2004 p. 5).
Second Life	A MUVE in which residents, represented by complex avatars can explore, meet other residents, socialise, participate in individual and group activities, and create and trade items (including virtual property) and services with one another. Since 2006, Second Life has increasingly become a focus for educational-based activities.
Sloodle	“An Open Source GNU-GPL project which integrates multi-user virtual environments such as Second Life® with learning-management systems (VLEs) such as Moodle® and helps the community of educators in virtual worlds test curriculum innovations and advocate those proven successful. Sloodle provides a range of tools for supporting learning and teaching to the immersive virtual world; tools which are fully integrated with a tried and tested web-based learning management system used by thousands.” (Sloodle. 2008)
Systems development methodology	A framework that is used to structure, plan, and control the process of developing a computerised information system
Synchronous learning	Traditionally, synchronous learning occurs when a learner and instructor are in the same place at the same time. In the online environment the individuals may be geographically remote but existing together in a virtual space at the same time. In this way instruction is distributed to many locations but occurs through realtime (simultaneous) interaction between students and their instructor.
VLE (Virtual Learning Environment)	A software system designed to support teaching and learning in an educational setting. A VLE will normally work over the Internet and provide a collection of tools such as those for assessment communication, uploading of content, return of students' work, peer assessment, administration of student groups, collecting and organising student grades, questionnaires, etc.

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11. Appendices

Appendix A

Core Skills Competency Framework

Version Number	Revision Date	Author	Changes Marked
0.1	11 th June 2007	Chris Swaine	Research mapped to bullet points
0.2	1 st July 2007	Chris Swaine	Revisions based on in-world comments and contributions via wiki.
0.3	23 rd September 2007	Chris Swaine	Further revisions based on out-world discussions
0.4	1 st October 2007	Chris Swaine	Move to phase 2 of plan
0.5			
0.6			



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Core Skills Competency Framework

We are suggesting that to be an effective educator in Second Life requires the acquisition of three sets of core competencies related to membership as i) a resident, ii) a learner, iii) a practitioner.

1. Core competencies / skills to become an effective SL resident.

1.1. *Users can enter and navigate the Second Life Environment*

- 1.1.1. Users are able to install updates, log in to the Second Life environment, and maintain security of their password and personal details.
 - Which registration portal
 - Types of membership
 - Orientation
 - Log in
 - Change password
 - Find technical support when needed
- 1.1.2. **Users are able to move their avatar around the Second Life environment, and control the Second Life camera.**
 - Walking
 - Turning around
 - Flying
 - Landing
 - Sitting
 - Teleporting
 - Camera controls
 - Map with zoom and mini map
 - Gestures
- 1.1.3. **Users are able to effectively search, locate, retrieve, store and manage information on locations within Second Life.**
 - Use SL search functions
 - Create landmarks
 - Create SLurls
 - Give landmark locations
 - Find and retrieve
 - Use advanced map and mini map functionality



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1.2. Users can make effective use of personalisation features

- 1.2.1. Users are able to make effective and appropriate use of preferences
 - Preference settings
 - Profile settings
- 1.2.2. Users are able to personalise their avatar
 - Appearance settings
 - Attach and detach items
 - Locate, put on, change and remove clothing
- 1.2.3. Users are able to effectively catalogue and store items through good inventory Management.
 - Create, rename, edit and delete folders
 - Move objects between folders
 - Rename folders
 - Effective use of inventory search functionality
 - Setting properties on objects
 - Managing objects and other materials
 - Deleting, transferring and creating backup files / folders

1.3. Users can make effective use of social networking tools and have an understanding on when and how to use them.

- 1.3.1. Users have an understanding of, and can make effective use of the 'Friends' facility.
- 1.3.2. Users understand the appropriate use of in-world text chat, instant messaging, and the use of gestures.
- 1.3.3. Users have an understanding of the use of real voice technologies

1.4. Users are aware of the safety issues of using virtual worlds , and they are able to manage their own personal safety.

- 1.4.1. An awareness of the issues relating to giving out personal information to other inworld residents or groups, or through other means such as profiles
- 1.4.2. Users are aware of how to report abuse
- 1.4.3. Users are aware of techniques and tools available to combat in-world abuse or harassment.



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Core Skills Competency Framework

1.5. Users understand what constitutes appropriate behaviour in-world - SLetiquette

- 1.5.1. How and when it is acceptable to approach others
- 1.5.2. Recording other people's conversations or taking photographs without prior consent
- 1.5.3. Asking for personal information
- 1.5.4. Users have an understanding of the strengths, challenges and differences of working within a diverse international environment

2. To be an effective learner requires the resident core skills, plus a further set of skills /competencies which would enable the use of tools and functionality to support their learning within Second Life.

2.1. Practicalities of learning in virtual worlds

- 2.1.1. An understanding of when to use of virtual worlds to support learning outcomes
- 2.1.2. An understanding of the technical constraints

2.2. Building and using appropriate learning tools and scripts

- 2.2.1. Ability to build basic objects to support learning
- 2.2.2. Setting up and using appropriate tools and scripts to support learning interaction with peers and teachers

2.3. How to transfer and utilise learning

- 2.3.1. Utilising skills learnt in Second Life to first Life
- 2.3.2. Utilising skills learnt in first life to Second Life

2.4. Communicating in learning groups

- 2.4.1. How to ask questions
- 2.4.2. How to share an idea
- 2.4.3. How to 'network'



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Core Skills Competency Framework

3. To become an effective practitioner requires both resident and learner core skills, plus a further set of skills to enable them to identify and set-up tools, as well as using appropriate and pedagogically sound approaches to learning and teaching, which support the personalisation of learning.

3.1 Building and using a virtual learning space

- 3.1.1. Practitioners are able to plan an effective and appropriate learning space to accommodate learner groups? and different approaches to learning styles.
 - Effective use of prims
- 3.1.2. Practitioners are able to identify the appropriate tools, scripts and functionality requirements to deliver effective in-world learning and teaching.
- 3.1.3. Practitioners are aware of, and can devise, build in and implement appropriate learner/ peer induction

3.2. Limitations of Second Life

- 3.2.1. Practitioners have a good understanding of the pedagogical and/or technical limitations of Second Life and when to devise and use a blended approach.
- 3.2.2. Practitioners are able to carry out appropriate audits to ensure that all learners within their group are able to effectively use Second Life as part of their learning episode.

3.3. Make effective use of communication tools to support learning and teaching.

- 3.3.1. Able to identify and make appropriate use of communications tools to support effective learning and teaching, including the use of a blended approach.
- **3.4. Personal safety and responsibility.**
- 3.4.1. Appropriate organisational, learner group and where necessary individual measures are negotiated and put in place to minimise risks associated with learner and practitioner safety.
- 3.4.2. Appropriate acceptable behaviour guidelines are negotiated with peers and individual learner groups.
- 3.4.3. Risks associated with health and safety are clearly identified.
- 3.4.4. Practitioners are aware of techniques and tools available to combat in-world abuse or harassment.



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Core Skills Competency Framework

3.5. Effective use of assessment techniques

- 3.5.1. Practitioners are able to identify, setup and implement different in-world approaches to support effective formative and summative assessment.



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Appendix B

Taxonomy of Second Life practices in learning and teaching activities: an analysis grid for 'hands-on workshops'

Version: 2

Activity	Range		
Planning and preparation			
Spatial design and layout <i>How is the virtual physical space for delivering the workshop designed and utilised ?</i>	Emulation of RL	Free form	Addressing pragmatics of SL environment
Instructional design <i>To what extent are the learning objectives, outcomes and goals organised ?</i>	Undefined	Semi-structured	Structured
Organisation of instructions and discourse <i>To what extent are the instructions and discourse organised in advance ?</i>	Unorganised	►	Pre-prepared
Physical organisation of learning material <i>In what form are the learning materials made available to the participants ?</i>	Unstructured	►	Structured folder(s) and givers devices
Business model <i>What is the economic model for learner participation ?</i>	Free	By donation	Set fee
Maturity level Development version <i>What is the maturity level of the workshop and its lifecycle?</i>	Alpha	►	Fully tested
Delivery of instruction, workshop implementation			
Assessment of prior/required knowledge <i>Is prior knowledge assessed? If so, how is prior it is assessed?</i>	None	Informal assessment	Formal assessment before the workshop
Pre-prepared activities to met the knowledge requirements <i>What type of pre-workshop activities has been planned to meet the knowledge requirements??</i>	None	Self-paced	Directed (Individual, groups activities)
Prior knowledge <i>How is prior knowledge recalled and connected to the workshop activities?</i>	Not recalled	On demand	Systematically recalled and connected
Preparation of user interface and viewing controls <i>To what extent are the instructions for organising the client user interface and camera controls given?</i>	No Instructions	►	Structured interface set-up and pre-set views
Technical preparation of participants <i>What technical advice and background information are provided?</i>	None	Instructions cover different technical issues <i>Avatars, AO and HUD, video performance, locations, landmarks, teleports, lag</i>	
Conversational flow <i>How is the conversational flow structured between tutor and learners ?</i>	Free and Improvised	Ordered and controlled progressively by behavioural rules, interaction policies, textual codes, scripted objects and communication tools	
Communication dynamics	Tutor → Learner	Tutor ↔ Learner	Tutor ↔ Learner and Learner ↔ Learner

Taxonomy of Second Life practices in learning and teaching activities: Analysis grid for "hands-on workshops" - V2
Margarita Pérez-García, MENON Network, BE & Dr Steven Warburton, King's College London, UK



Appendix C

Second Life's Potential Educational Activities

The literature review, currently underway as part of the project, has identified aspects of Second Life relevant to its use in adult education. They are listed below to inspire and help interested educators think about the relevance of Second Life to their own teaching and learning contexts.

General points

- Second Life is a virtual world, particularly attractive to those motivated by developing teams and communities, exploring collaborative teamwork, developing social and professional networks, and exploring the creation of digital and virtual objects.
- Second Life provides for both synchronous and asynchronous learning activities suitable for both extrovert and introvert types of learners.
- Second Life activity can usually be enhanced by other forms of educational media. However, the pilot is seeking to identify learning outcomes and activities that Second Life can uniquely support.
- Identifying learner styles and personalities can be useful in informing the design and delivery of activities. The design of activities flexible enough to allow for a variety of learning styles would be valuable.
- Unlike many online gaming environments, women and older learners appear to react the most positively to Second Life. It may be useful to bear this in mind both when considering potential students and learning activities.
- Second Life does have a steep initial learning curve and both staff and students who participate in the pilot will require orientation that will be provided by the project team. This needs to be considered when identifying potential pilots.

What Second Life might be good at (we think and at present)

- **Creating 'enhanced reality' spaces for learning.** By this we mean the opportunity to provide experiences and situations otherwise inaccessible to students such as ancient Rome, the NASA space museum, the outer planets or scaled up models of the human body. Activities can be developed that allow students to interact with these spaces in innovative ways, such as rearranging atoms in a molecule, or interacting with others in realistic role playing situations.
- **Providing a rich environment for role-playing simulations.** These are currently found in some of the medical, nursing, social work, business and IT areas.
- **Creating metaphorical representations of difficult abstract and intangible concepts.** In Second Life these metaphors could become real; e.g. sub-netting addresses could explode in colourful firework displays or locked mailboxes substitute for database tables.

- **Providing opportunities for students to construct their own meaning and learning through their interaction with Second Life ‘builds’.** For example, in the ‘build’ of Dante’s Inferno, visitors are led down through the seven levels of Dante’s vision. Visitors are asked to nominate, with reasons, their own inhabitants for these levels. These are then available for others to read, ponder and comment on.
- **Constructing simulations of real world activities.** For example, students could be provided with the means to plant, care for, harvest and successfully market a horticultural crop. Another possible example is the construction of machinery or the design and construction of buildings, either to understand how they work or to investigate aspects such as sustainability. There are also opportunities for students to exploit the provision of the inworld economy to study a number of business activities such as marketing.
- **Providing students with the opportunity to practice life skills, such as, job interviews, interpersonal skills and cross cultural communication.** There are several career consultancies and recruitment agencies in Second Life which could be the basis of some of these activities. We believe that small group discussions, when clearly focussed, can provide a useful forum, both for open debate and for empowering students who may not engage as readily in a classroom situation.
- **Foreign language acquisition.** Particularly with the use of voice, the study of other languages is becoming a well-developed area in Second Life, for example, English Village is a well resourced and major ‘build’ for English language acquisition.
- **Providing a unique medium for creative arts.** For example, showcasing student work, providing a fascinating stimulus to creative writing, or a possible venue for live music performance. It can also be used to construct machinima (inworld videos).

What Second Life doesn’t do well (we think and at present)

- While it is possible to provide both synchronous and asynchronous PowerPoint presentations, we believe that unless these are an important adjunct to other Second Life activities it is usually better served by other online applications.
- Second Life requires a reasonably high level of technical infrastructure in terms of broadband access and speed and graphics capability and processing speed on individual machines.
- Second Life does not have a seamless interface with other web products, although both mp4s, and audio files can be played and live video and audio streams can be captured. General access to the web can be handled via the inworld browser window. However, activities that require extensive use of these applications is probably not best suited to the pilot.

Appendix D

Designing Learning for Second Life Activities

Aim

To set out a process for designing learning activities to achieve the SLENZ project objectives.

Plan for flexibility

Because all of us involved in the SLENZ project are learning through the project, it is important that our process for designing learning activities is flexible and engages as many of the participants as possible. Our aim is that the people who will pilot the learning activities will have a sense of ownership over the activities, and so their involvement is necessary throughout the process. However, the process also needs to recognise that people have limited time to give to the project and other priorities. Because the team members are in different locations, our process needs to include face-to-face and online interactions.

Objectives

- Identify learning objectives related to publicly funded and approved courses that are currently being run in more than one educational organisation that will be the basis of learning experiences.
- Develop a range of learning activities to assist people to achieve those learning objectives.
- Develop a list of reference materials and resources that will be used in the learning activities.
- Details of any learning support services that are required or available for people to use throughout their involvement in the learning activities.

Discussion points

Consider a wider context than just the Second Life interface. For example: a full experience might start with a face to face connection, followed by a variety of computer access experiences, initial online communication through email or other message system, eventually leading to a website, and then periodic activities in Second Life. Here we take into account a full picture of the learning experience without ignoring real impacts on learning objectives.

- How can we design inclusive learning experiences that enable access to a diverse range of people?

- Teachers, learning designers and learning activity developers may need to become more conscious of the cultural assumptions and values reinforced in computer-mediated educational experiences?
- How can we ensure efficient production processes that result in maximum reusability of end products and processes
- Other discussion points drawn from lit review

Appendix E

Principles for Design and Implementation of Second Life ‘Builds’

Purpose

To set out some principles for the design and implementation of ‘builds’ in support of the pilot activities within the SLENZ project.

As with the ‘process for designing learning activities’ all work that is undertaken in this area is of an experimental nature; we are working in an area in which there are no clear guidelines or best practices. However, there is a need to adopt some form of consistent practice in order to maintain some control over the storing, re-use, testing and versions of the objects and code that are built. Consistency will also allow several developers to be involved in building activities concurrently.

An aim of the SLENZ project is that the people who will pilot the learning activities will have a sense of ownership over those activities, and so their involvement as ‘customers’ of the development team is encouraged throughout the process although it is recognised that people have limited time to give to the project and other priorities.

Because the team members are in different locations, our process needs to include face-to-face and online interactions.

Objectives

- Create the resources both in and out of Second Life to enable the learning activities identified by the learning design process.
- Ensure through critical evaluation that the resources are fit for purpose as determined by the educators who will be using them.
- Ensure that all ‘builds’ are constructed in line with technical best practice, e.g. consideration of prim limits, clear and efficient code, consideration of lag issues.
- Ensure that all ‘builds’ are clearly named and versioned and backed up.

Principles

As the literature review suggested, the principles of the AGILE methods of software development may well be suited to the development of these builds, and in particular some of the aspects of Extreme Programming. These methods are well suited to risky

projects with dynamic requirements and the principles, adapted to the needs of the SLENZ project, that we should adhere to are:

- customer satisfaction through early and continuous delivery of useable artefacts
- welcoming changing requirements at all stages of development
- developers and lead educator working closely together
- frequent and open high quality communication between all team members
- continuous attention to technical quality
- regular team reflection on the effectiveness of the process and willingness to adapt the process as required.

Implications

Adoption of these principles would have a number of implications for the way in which the development team would work and although the specific details cannot be detailed here, the following guidelines would provide the basis of the working plan for the builds and would inform the activities of Day 3 of the planned workshop.

- one of the outputs of the learning design process will need to be the User Stories describing the relevant learning activities
- the overall ‘build’ for each activity will need to be sketched out and then broken down into a number of ‘elements’. Each element will itself be made up of a number of atoms, e.g. scripts, 3D objects etc. Storyboarding, the refinement of user stories and the creation of scenarios are likely to be useful at this stage.
- a collection of elements, probably relating to one (or one aspect of) a ‘user story’ will be identified as making up a ‘release’
- a tentative timetable for the delivery and acceptance testing of releases will be agreed. Each release will incorporate and build on the previous release, allowing for iterative development.
- formal version control will be used for all ‘releases’ to minimise any risk of confusion when releases are re-worked in response to user requests or error identifications etc.
- the development team will be responsible for the initial testing of each release before it is offered to the ‘users’. This testing will include the evaluation of technical considerations and an initial evaluation against the specific requirements that the release is fulfilling.
- the development team will seek comprehensive feedback to each release from a wide a group as possible, however the lead educator will have the final decision on when a release is accepted.
- elements and releases will initially be built to fulfill the requirements of the specific activity but all attempts will be made to allow for future re-usability of elements. Re-factoring of elements for re-use will become standard practice as the development proceeds through the 3 stages of the project.
- communication between team members, which includes the lead educator, should be frequent and as far as possible on a ‘need to talk’ basis. However, a

slightly more formal meeting at a regular time on a weekly or fortnightly basis should be arranged.

- as each release is created it will be backed up within Second Life and if possible externally as well. The creator of the release will be responsible for the back-up.

Requirements

A number of things need to be determined in order to make best use of this process.

- a standard naming convention will need to be determined for each pilot which should enable the identification of the following:
 - which pilot
 - which element
 - type of element
 - which atom
 - type of atom
 - which release
 - which version
- a standard means of, and location of, back up storage needs to be determined
- a standard means of version control needs to be established

Definition of terms

This document uses a number of terms and interprets them in a way specific to this project and to Second Life. The following definitions explain how they should be understood in this context.

Atom – the smallest unit of built object. This could be a script to be embedded in a 3D object, a texture or collection of textures (e.g. a PowerPoint presentation to be embedded in a 3D object), an animation or collection of animations, a HUD or a simple 3D object.

Element - a collection of atoms that together make up a specific 'build'. For example, all the atoms that make up a meeting room in SL, including PowerPoint presenter, chairs, room, animations, presenter HUD etc could be an element. (In a complex build this example could in fact be a number of elements).

Release – a collection of elements which together create or support a coherent whole or partial user story. A release will need to be sufficiently coherent in fulfilling some requirement of the learning activity need to allow for acceptance testing. After the first release, a release should incorporate all previous releases until the final build is complete.

User story – a description in non technical words of what the learning activity is, what it needs to provide and what it needs to do. The user stories will be an output from the learning design process. Within the development process the user stories may themselves be broken down into smaller units or scenarios.

Appendix F

Points for discussion and consideration

Recommendations for the project design and delivery

Second Life should be regarded as a sub-set of both e-learning and face-to-face teaching and as such informed by the established best practice recommendations and the theoretical underpinnings of both media. Second Life is most effective when blended with other online and face-to-face media in a seamless manner.

One common oversight in the design of online learning is allowing the technology to drive the process at the expense of sound educational pedagogy. During the LD it is vital to accept that the medium is merely a vehicle to deliver content, something that can be difficult given the distinct roles and knowledge of educators and IT developers.

A clear understanding of the theoretical frameworks of those involved in the SLENZ project is valuable both for team dynamics and to inform design and delivery that is consistent with the espoused theoretical framework(s).

Behaviourism, cognitivism and constructivism are all relevant theories of learning. Second Life can also be driven by both a post-modernist and critical theory theoretical framework. To attempt to adhere to a strictly constructivist, post-modernist theory of learning and worldview can be both disingenuous and undermine the educational potential of Second Life.

What might occur in this project is that a behaviourism informs the “learning Second Life” components of the pilots (didactic learning might be the most efficient way to get students up to the desired competences), whereas a constructivist approach can increasingly guide the subsequent activities (*role* playing rather than *rote* learning).

Situated learning requires meaningful, realistic activities. It is necessary to link the Second Life to Real Life – i.e. the learning has to be perceived as useful outside the virtual environment. It also requires provision of significant opportunities for discussion and time, with perceived learning from online courses directly related to the amount of discussion actually taking place in them. This aspect will be compromised due to the short time allocated to these pilots. Hence subsequent courses may provide a richer, more meaningful experience.

Pedagogic practice consistent with a cognitivist approach suggests information to be chunked, with five to nine items on an online screen to prevent overloading and maximise possibilities for deep processing and the transfer to long-term memory. Information maps are effective should more information be supplied (Ally, 2005). Encouraging learners to connect the information to the real world also supports this transfer, something that Second Life is well-designed to exploit.

Educators need to plan for the time and activities required to get students to the stage where they are comfortable enough in Second Life to start constructing the meaningful knowledge. The more Second Life literate, the richer the learning. Both tutors and students need extensive orientation training prior to starting Second Life activities. At a minimum students need to complete points 1 and 2 of the Second Life Core Competencies.

Due to the limited resources in terms of time and money and (to a lesser extent) expertise, it is suggested that SLENZ learner development is informed by a streamed-

down version of agile (agile with a lower case “a”). Two–four weeks for each iteration (as suggested best practice) is not possible. Nor is it possible to meet in person on a daily basis, nor include students (the customers) to a great extent. Pragmatism will determine the method employed.

Extreme programming offers a clear and practical model for educational development. Of practical note is the prominence given to iteration, use of metaphor to clarify design and collective ownership. These are also key principles of the SLENZ project. The close involvement of the intended users is only possible to a limited extent

Cultural aspects need to be accounted for in the design and delivery. Some students may be alienated from Second Life if taught that work and play do not mix (Vogel et al, 2008).

Individual learning styles and personalities are likely to impact the responses of students to the activities. Accounting for these differences should be built into the design, recruitment and delivery processes.

The following survey is adapted from a widely used US Student Online Orientation. The intention is to determine tolerance for ambiguity, personality and learning style(s). This guide can be utilised in the design stage in order to recruit appropriate students.

Student Orientation-A Guide to Second Life: Is Second Life For You?

1. Being in a classroom and-or socializing with fellow students is:
 - a. Very important to me.
 - b. Somewhat important to me.
 - c. Not particularly important to me.
2. I usually:
 - a. Put things off until the last minute.
 - b. Need reminding to get things done on time.
 - c. Finish things ahead of time.
3. I find classroom discussion:
 - a. Usually helpful.
 - b. Sometimes helpful.
 - c. Rarely helpful.
 - d. Depends on the subject.
4. I think that learning a content –rich subject like statistics is best done by:
 - a. Listening to a lecture
 - b. Discussing solutions with other students
5. I think that learning an opinion–rich subject like education is best done by:
 - a. Listening to a lecture
 - b. Discussing solutions with other students

6. When instructors hand out directions for assignments, I prefer:
 - a. Having them, explained to me.
 - b. Trying to follow them on my own, then asking for help as needed.
 - c. Figuring them out for myself.
7. When asked to use computers or devices and technologies new to me:
 - a. I put it off or try to avoid it.
 - b. I feel apprehensive, but try anyway.
 - c. I look forward to learning new skills.
8. If required to download and install a browser plug-in, I would:
 - a. Require assistance to complete the task.
 - b. Look for information on the correct procedure before proceeding.
 - c. Proceed with confidence.
9. I participate in online role-playing fantasy games such as WOW:
 - a. Never
 - b. Occasionally
 - c. Frequently
10. I socialise online:
 - a. Never
 - b. Occasionally
 - c. Frequently